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Telecommunications Market Review And Forecast

Annual Report of the Telecommunications Industry

North
American
Telecommunications
Association

1990
Edition

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TELECOMMUNICATIONS MARKET REVIEW AND FORECAST

Annual Report of the Telecommunications Industry

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FOREWORD

The year 1989 was filled with developments that will shape our industry for years to come. International trade took center stage as the outcome of critical events had profound implications. The integration of computer and telecommunications technology accelerated, with the market for data communications equipment becoming one of the hottest sectors of the industry. Systems integration in telecommunications has begun to sweep the industry as an opportunity for growth and increased profitability. ISDN began to emerge as a commercial reality. Statistics on the facsimile marketplace require continual updating as the market exceeds all expectations. With entry into the market by the Bell Operating Companies, with user acceptance on the rise, and with more and more innovative applications, voice processing is poised to experience even more rapid growth in the next few years than it has heretofore seen. Even mature markets, though continuing to be sluggish, began to show signs of modest growth. In short, the telecommunications marketplace is one where the only constant is change.

The North American Telecommunications Association (NATA) is uniquely positioned to ensure that the changes taking place in the telecommunications marketplace are rooted in an environment that promotes fair and open competition. NATA is the leading nationwide trade association representing over 700 manufacturers, distributors, suppliers, carriers, consultants, and users of communications and computer products and services. The Association was founded in 1970 by Tom Carter and other farsighted businessmen dedicated to the establishment and viability of a strong manufacturer/distributor industry independent from the Bell System. Through NATA's efforts, these companies have grown and matured and become a multibillion dollar industry bringing business and residential consumers a full range of sophisticated communications products and services.

Increasingly recognized as the single industry source for vital market intelligence, **The Telecommunications Market Review and Forecast** contains in one volume, statistical and analytical descriptions of the full range of telecommunications sectors. The report is based on data collected by the NATA Market Research Department from government and private sources. Market trends have been confirmed by numerous industry representatives and analysts. This report represents the best efforts of the NATA Market Research Department at preparing a useful guide to the complex and dynamic telecommunications marketplace. NATA staff is available to answer any questions relating to the statistics or analyses presented herein by calling 1-800-538-6282 or 202-296-9800.

Eric G. Nelson
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EXECUTIVE SUMMARY

INDUSTRY OVERVIEW

The U.S. telecommunications network is comprised of 23,000 central office switches, more than a billion miles of transmission lines, almost as many miles of special service circuits, and 119 million access lines connecting customers to the public switched telephone network. The U.S. telecommunications marketplace is unique in the world for its size, sophistication, and diversity.

The total U.S. market for telecommunications equipment grew by a compound annual growth rate of almost 10 percent a year from $20.9 billion in 1984 to $28.5 billion in 1987. Estimates for 1989 indicate that the growth rate is slowing somewhat and that the market amounts to $32.7 billion, 8 percent above 1988. Preliminary projections suggest however, that the market will pick up steam through the first half of the 1990s and grow at slightly more than 10 percent a year to $58.3 billion by 1995.

The growth in the telecommunications marketplace is being stimulated by a number of factors--some already in place, others looming on the horizon. Technological developments coupled with growing user demand for advanced equipment and services is spurring the markeplace. Data communications systems, cellular mobile radio systems, and fiber optic transmission systems are being integrated into the conventional voice network, which is increasingly being converted from analog to digital systems. Most of this conversion has taken place in the transmission of signals between switches. This has vastly expanded the capacity of the network for the increasing demands placed on it.

One of the most significant future uses of the increasing capacity is the rapidly evolving, completely digital, Integrated Services Digital Network (ISDN). ISDN, which is an architecture of standards for digital transmission, will provide for the combination of voice, data, and video into one network and will eventually replace the current network, giving users tremendous flexibility in communications. The implementation of ISDN will create a vast market for products and services. Some estimates put the market for ISDN-related equipment alone, at about $10 billion by 1995.

In general, the telecommunications marketplace represents the compromise between what users are demanding and what technology can provide. A company's telecommunications network is increasingly viewed as a strategic business asset with expanded responsibilities for increasing revenue and decreasing costs. Users are positioning their telecommunications systems to stimulate revenue through increased customer accessability to the business through 800 numbers, voice messaging/response systems, etc. In addition, users are requiring that their telecommunications systems be sophisticated in tracking traffic patterns, identifying abuses, and generally keeping telecommunications costs to a minimum.

As the sophistication of users grows, they will increasing turn to new services such as voice messaging, audiotex, 900, packet switching, etc., as tools to impact their profitability. This heightened user awareness provides tremendous opportunities for vendors.

The U.S. telecommunications marketplace is the largest in the world, and, since the AT&T divestiture, is one of the most open marketplaces in the world. This has led to intense competition from both domestic and foreign suppliers. In 1988, approximately 21 percent of the U.S. telecommunications market was supplied from abroad; up from 17 percent in 1984. This has caused friction in the international telecommunications trade environment, because U.S. producers are frequently not provided the same market access abroad as foreign suppliers are provided in the United States.

A manifestation of this friction occurred in early 1989, when the United States Trade Representative determined that Japan had breached a 1986 agreement designed to open the Japanese market to foreign suppliers. The imposition of retaliatory sanctions on certain Japanese-made products was narrowly averted at the eleventh hour when the Japanese agreed to make various concessions. Despite this friction, the U.S. government seems to be committed to free trade and has initiated several measures to that end. Included are the implementation of a free trade agreement with Canada, creating the largest trading block in the world, and participation in a new round of multilateral trade negotiations under the auspices of the General Agreement on Tariffs and Trade, the international organization tasked with managing the free world's trading system.

While on the whole the telecommunications marketplace presents tremendous opportunities for equipment and services providers, it is also a marketplace that requires extensive study because of its complexity and intensely competitive environment. Not all bandwagons are destined for success. Certain firms and sectors within the industry will not survive. Acquisitions and mergers are commonplace in all sectors of the industry--equipment and service. During 1989, there were some 100 mergers or acquisitions in the industry. Distributors were key targets of the acquisition trend, as manufacturers and carriers sought to secure stable outlets for their products and profitable aftermarket sales.

The bulk of the market for telecommunications equipment and services is comprised of purchases by private businesses, common carriers, and residential consumers. Other important market segments include the government and private carriers.

Overall, corporate users increased their 1989 telecommunications budgets by 39 percent over 1988. In 1988, expenditures for voice communications accounted for 66 percent of total telecommunications expenditures, while data communications accounted for 34 percent. In 1989, voice accounts for 64 percent, while data is up to 36 percent. This trend is likely to continue as distributed processing of information becomes more prevalent and communication of data becomes an increasingly essential part of business activity.

In addition to increases by corporate users, telephone common carriers are increasing their expenditures. New investment by local exchange carriers in plant and equipment (including more than telecommunications equipment) in 1988 amounted to $20.7 billion, an increase of almost 3 percent from 1987. Added to that, in 1988 long distance carriers spent nearly $16.3 billion on new plant and equipment, up over 10 percent from 1987. In total, telephone common carriers (excludes private network carriers) spent $37 billion on plant and equipment. Preliminary 1989 estimates indicate common carrier construction spending is amounting to $39 billion. This growth in spending is likely to increase through the mid 1990s as carriers upgrade their networks to implement ISDN and other advanced network services.

Residential users are also increasing their purchases of telecommunications equipment. Residential consumers increased their purchases from $2.7 billion in 1987 to $2.9 billion in 1988 and are estimated to reach $3.2 billion in 1989. This segment of the marketplace will likely continue to grow moderately through the mid 1990s.

CUSTOMER PREMISES EQUIPMENT

The business telecommunications marketplace (including government purchases) experienced rapid growth during 1987-1989, jumping from $13 billion to $19 billion. Much of this growth is attributable to the soaring data communications equipment market which increased from $5.1 billion in 1987 to $7.0 billion in 1989. This segment is likely to continue to expand at a brisk pace as distributed processing becomes ubiquitous and remote data entry with devices such as credit card validation terminals and point-of-sale terminals become increasingly popular.

Other segments of the business telecommunications marketplace experiencing rapid growth include the facsimile terminal and voice processing markets. The fax market exploded from $821 million in 1987 to almost $3.0 billion by 1989. The fax has become an essential part of business communications, and the office without a fax is fast becoming an isolated phenomenon. New technologies that allow fax terminals to be hooked to personal computers, allow faxs to double as photocopiers and/or printers, and increase the speed of fax transmission continue to boost the market. Voice processing, principally voice messaging and voice response systems, are also rapidly becoming accepted in the business place as a means of increasing efficiency and customer/client satisfaction, and generating revenue. The market for voice processing equipment surged from over $800 million in 1987 to more than $1.5 billion in 1989. Expectations are that the market will grow even more rapidly in the near future as consumer acceptance of "talking into a machine" grows.

The traditional segments of the customer premises market--PBXs and key systems--have not fared as well. Due to intense competitive pressures, the value of the PBX market decreased somewhat from $3.1 billion in 1987 before stabilizing at $3.0 billion for 1988 and 1989. This lackluster performance is likely to improve somewhat during the early 1990s as customers that bought in the great buying spree of 1984 and 1985 begin to replace their products and as ISDN standards become implemented and ISDN-compatible PBXs gain popularity. With the key system market, total sales increased marginally, from $960 million in 1987 to $965 million in 1988. Towards the end of 1989, prices began to firm as a result of the AT&T dumping case, an important trade action filed by AT&T against Japanese, Taiwanese, and South Korean producers. This stabilization of prices helped increase the market to $990 million for 1989.

Other factors affecting the PBX and key marketplace include the revitalization of centrex services by the telephone companies (a service that competes in functionality with PBXs) and the growth of the secondary market, i.e., the market for used equipment. The secondary market has grown from practically nothing a couple years ago to over $450 million by 1989.

The consumer telecommunications market, principally corded, cordless telephones, and answering machines, continues to expand, increasing from $2.3 billion in 1987 to $2.8 billion in 1989. The most significant growth area was registered in the cordless telephone segment of the market which increased from $355 million in 1987 to $440 million in 1988 and to an estimated $525 million in 1989.

NETWORK EQUIPMENT

The U.S. market for telecommunications network equipment consists of purchases by telephone companies and other companies for private networks. The total market for such equipment increased from $8 billion in 1987 to $12 billion in 1989. This growth is due, in part, to the increasing popularity of cellular telephone systems. Annual capital expenditures of cellular common carrier equipment increased from $234 million in 1984 (the year cellular radiotelephone service was authorized by the FCC) to $526 million in 1987 and to $750 million by 1989. In addition, telephone common carriers have been upgrading many of their central offices for implementation of ISDN trials.

The market for central office (CO) switches increased irregularly from $2.9 billion in 1984 to $5.5 billion in 1986 before decreasing somewhat to $5.0 billion in 1989. As cellular telephone systems convert from analog to digital technology, which is likely to begin in the early 1990s, and as implementation of ISDN and other advanced services progresses, the market for CO switches will accelerate and is projected to amount to $9.1 billion by 1995. Digital CO switches increasingly used for wireline networks and under development for cellular systems compete successfully with PBXs in offering such advanced features as voice mail, speed calling, conferencing, call forwarding, call waiting, and CO-based local area networks.

Fiber optics is another important growth segment of the network equipment market. The market for fiber optics in the United States doubled from $410 million in 1984 to $883 million in 1986, doubled again to $1.7 billion in 1988 before experiencing slower growth but still increasing to $2.0 billion in 1989. The explosive growth in fiber optics has been due principally to long distance carriers' purchases. Most long distance carriers now have replaced the majority of their network with fiber optics, a relatively low cost, very high capacity medium. Purchases by long distance carriers will no longer provide the impetus for rapid growth in the fiber market. However, local exchange carriers have begun to lay fiber in the local loop, principally to new businesses. Retrofitting to existing businesses while slower to develop, will also provide growth potential. Fiber to the home is not likely to happen for decades. One of the most promising growth areas for fiber optics is with local area networks (LANs). For a variety of reasons, fiber is increasingly being used as the medium of choice in LANs.

TELECOMMUNICATIONS SERVICES

The U.S. telecommunications network links telecommunications and computer equipment for voice, text, data, and video transmission. About 85 percent of the traffic on the domestic public network is voice; while data accounts for roughly 10 percent; and video and other specialized services account for the remainder. Currently about 430 billion calls are placed each year over the public network. On average, each person in the United States makes almost 2,000 calls a year, or almost 5.5 per day. Businesses account for around 20 percent of long distance domestic telephone use; residential users account for some 71 percent, government and specialized users make up the rest. There are more than 220 million telephones in use in the United States, with about 93 percent of all households having telephone service.

There are currently more than 119 million access lines in the United States--70 percent dedicated to residential use, 28 percent for business use, and the balance for specialized use.

The principal providers of telecommunications services are common carriers. This type of company is obligated to provide service to customers on a nondiscriminatory basis. Common carriers that provide basic service can be divided into two basic types--local exchange companies and interexchange companies.

Local exchange companies are comprised of two general groups--some 1400 independent telephone companies, and the 22 companies that were spun off by the divestiture of AT&T which are grouped into seven regional holding companies. Local telephone companies had total revenues from all sources of approximately $105 billion in 1988, up somewhat from 1987.

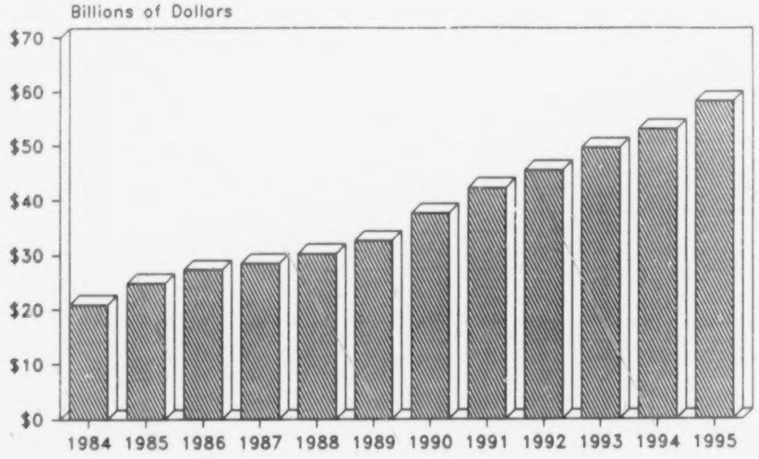
Interexchange companies provide long-distance services. The top three interexchange carriers that collectively account for over 90 percent of the long distance market are AT&T, MCI, and Sprint. The total market for long distance services amounted to almost $52 billion in 1989, a 14 percent increase over 1988.

Implementation of ISDN is one of the key potential growth factors for the telecommunications services marketplace. A number of ISDN trials began in 1988, but general implementation, even on a commercial basis, is still several years away. ISDN to the home will not occur before the turn of the century and probably even later than that. For business users, ISDN will provide a great variety of features currently unavailable from the public network. ISDN will allow simultaneous transmission of voice, data, and video over a single transmission path. In addition, features that have traditionally been available only with a sophisticated PBX will be available to all ISDN users.

Aside from the promise of new services with the implementation of ISDN, the traditional telecommunications services business is no longer limited to basic telephone and telegraph service. Because of the convergence of voice and data in both technology and market structure, the industry now provides such services as computerized data transmission, electronic mail, videotext, database access, software-defined "virtual" networks, "800" service, "900" service, teleconferencing, facsimile, voice messaging and other voice processing, call forwarding, call screening, environment control, and control of security devices.

FIGURE 1

Value of the U.S. Telecommunications Equipment Market, 1984–1995



Source: NATA Market Research Department

Table 1

Value of Selected U.S. Telecommunications
Equipment Markets, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	CAGR*
	Millions of Dollars						Percent
Private Branch Exchanges	2,843	3,086	3,105	3,050	2,928	2,875	.2
Central Office Switches	2,900	4,750	5,500	5,100	5,050	4,975	11.4
Key/Hybrid Telephone Systems	1,039	955	957	960	965	990	-1.0
Telephone Sets (all types)	1,200	1,585	1,685	1,750	1,825	1,875	9.3
Facsimile Equipment	175	164	260	821	1,825	2,887	75.0
Modems	1,100	1,266	1,500	1,650	1,840	2,025	13.0
Multiplexors (including T-1)	550	613	700	840	1,200	1,600	23.8
Local Area Network Equipment	300	450	700	800	1,025	1,450	37.0
Fiber Optic Equipment	410	500	883	1,011	1,650	1,990	37.1
Radio Communications Equipment (mobile radio systems and radio communications links)	3,500	3,750	3,970	4,250	5,000	5,110	7.9
Other Telecommunications Eqpt.	6,835	7,665	8,102	8,286	6,972	6,948	.3
Total Telecom Equipment	20,852	24,784	27,362	28,518	30,280	32,715	9.4

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(e)	CAGR*
	Millions of Dollars						Percent
Private Branch Exchanges	2,850	2,925	3,100	3,250	3,285	3,400	3.6
Central Office Switches	5,125	5,975	7,100	8,050	8,575	9,100	12.2
Key/Hybrid Telephone Systems	1,050	1,100	1,125	1,175	1,250	1,275	4.0
Telephone Sets (all types)	1,890	1,975	2,100	2,250	2,375	2,863	8.7
Facsimile Equipment	3,850	4,457	4,958	5,361	5,723	6,476	10.9
Modems	2,450	2,785	2,850	2,875	2,850	2,625	1.4
Multiplexors (including T-1)	2,125	2,750	3,025	3,070	3,125	3,482	10.4
Local Area Network Equipment	2,020	2,210	2,251	2,375	2,550	2,685	6.0
Fiber Optic Equipment	2,540	2,950	3,520	4,300	4,950	5,810	18.0
Radio Communications Equipment (mobile radio systems and radio communications links)	5,450	6,750	7,450	8,326	9,125	10,320	13.6
Other Telecommunications Eqpt.	8,317	8,468	8,077	8,589	9,302	10,344	4.5
Total Telecom Equipment	37,667	42,345	45,556	49,621	53,110	58,280	9.1

(e) Estimated
* Compounded Annual Growth Rate
(p) Projection

Source: NATA Market Research Department

U.S. TELECOMMUNICATIONS MANUFACTURING INDUSTRY

U.S. TELECOMMUNICATIONS EQUIPMENT MANUFACTURING INDUSTRY

The U.S. telecommunications equipment manufacturing industry is one that typically focusses on the production of high-end, high-technology products. Much of the manufacturing of consumer-oriented, relatively low-end products is conducted abroad and imported. As shown in Table 2, U.S. producers' factory shipments of all types of telecommunications equipment increased from $19.7 billion in 1984 to $25.5 billion in 1985 and is expected to increase to $27.4 billion in 1989. As shown, most of the segments show some positive growth, with the very notable exception of facsimile terminals. Despite an exploding market, U.S. manufacturers have virtually stopped fax production. The only area of the fax marketplace that U.S. producers are addressing is the PC fax boards market. These devices are board-level components that can be inserted in a personal computer to allow PC-to-fax communications. This currently represents a relatively small part of the overall fax market.

Central office (CO) switches represent the most significant product area for U.S. producers, accounting for an estimated 17 percent of total manufacturers' shipments in 1989. Other significant product areas in 1989 included data communications equipment (16 percent), mobile radio communications systems (11 percent), common carrier line equipment (10 percent), miscellaneous switching equipment (7 percent), PBXs (5 percent), and radio communications links (6 percent). Miscellaneous products and parts account for the balance.

The relative health of the industry can be analyzed by reviewing such information as inventories, capital expenditures, etc. (see Table 3 and Fig. 3). Some of the indicators point to a rather healthy industry. Estimated 1989 year-end inventories decreased from year-end 1988 inventories in both absolute terms from $6.4 billion to $6.3 billion, and as a share of production from 25 percent to 23 percent. Other positive factors include the decreasing cost of materials. As a percent of shipments, the cost of materials has decreased from 41 percent in 1988 to 40 percent in 1989. In addition, as a share of the value of shipments, total wages have been rather stable for the past several years. These indicators point to a rather healthy industry. Moreover, the industry is operating at a higher productive capacity than either the computer industry or the average for all manufacturing establishments.

Other operating and financial ratios, however, suggest that the industry, while healthy, is perhaps not as robust as the computer industry. For instance, expenditures on research and development as a percent of net sales in the telecommunications equipment industry averaged 6.6 compared to 12.0 for the computer industry. The current and quick ratios for communications equipment were 1.5 and 1.8, respectively, compared to 1.6 and 1.4, respectively for the computer industry. Return on equity amounted to 7.6 percent, 8.6 percent, and 5.0 percent for the communications industry, computer industry, and all manufacturing industries, respectively.

In general, the implications are that the communications equipment industry is getting increasingly more efficient and profitable and that, at least by some measures, is healthier than the manufacturing sector as a whole; although not as robust as certain specific industries such as the computer/office equipment industry. It is likely that the trend towards increasing efficiency will continue in the near future, and that capital expenditures will likely rise as the industry prepares for the wide-spread implementation of the Integrated Services Digital Network (ISDN) and the age of digital communications.

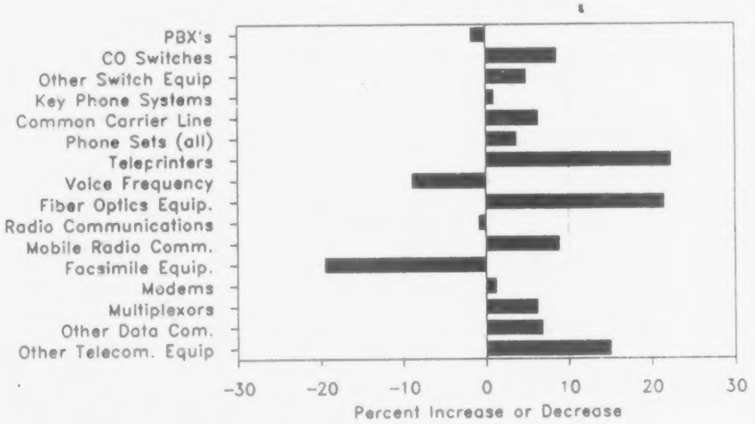
Despite a generally positive scenario regarding the strength of the industry as a whole, it is clear that U.S. producers of certain products are not faring well financially. This is especially true for U.S. producers of commodity, consumer-oriented products. In general, the closer the product is to the mass market, the more difficult it is for U.S. producers to maintain profitability.

The trend in prices that producers charge for their equipment for the first arm's length (wholesale) transaction has varied by product (see Table 5 and Fig 4). Overall, for all telephone and telegraph equipment (not including radio equipment or fiber optic systems), prices increased 11 percent from 1985 to 1989. Prices of CO switches increased 8 percent from 1985 to 1987 before decreasing, and, by 1989, amounting to just slightly above 1985 prices. Prices of telephone sets, the segment with the most price sensitive demand, decreased more than 11 percent between 1985 and 1989.

Prices for exports of U.S.-made telephone and telegraph products increased more than 9 percent between 1985 and 1989, while import prices increased irregularly by more than 8 percent during the time period. For radio and television communications equipment (includes mobile communications systems, radio communications links, fiber optics and radio and television broadcast equipment) the comparisons are even more dramatic. Export prices increased a mere four percent, while import prices increased by 14 percent during 1985-89.

FIGURE 2

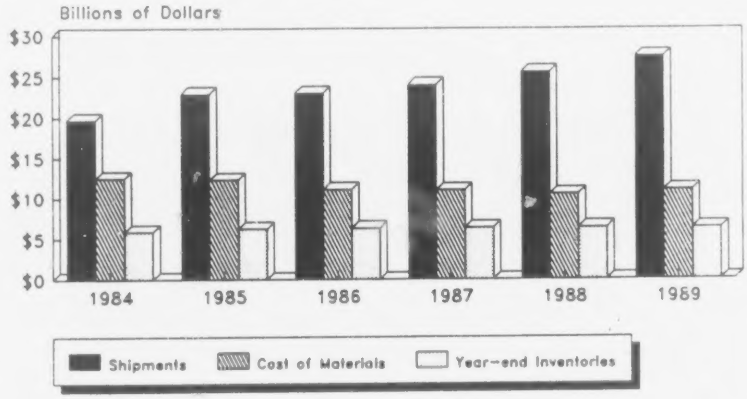
Annual Growth Rates of U.S. Manufacturers' Shipments of Selected Telecommunications Equipment, 1984–1989



Source: Based on statistics of the U.S. Department of Commerce

FIGURE 3

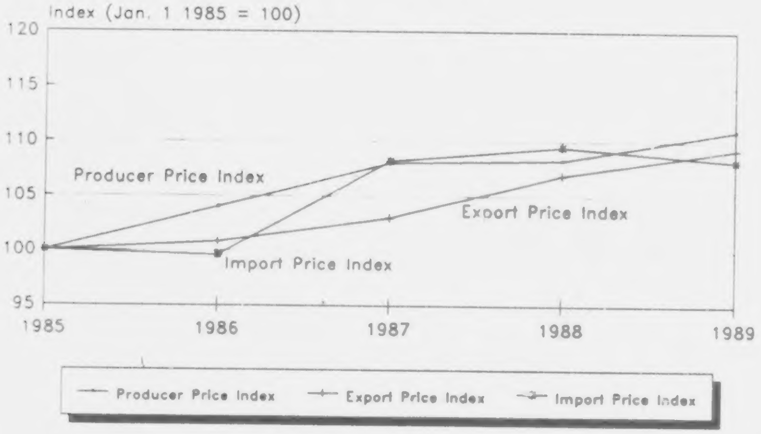
Manufacturers' Shipments, Material Costs, and Year-end Inventories of Telecommunications Equipment



Source: Based on statistics of the U.S. Department of Commerce

FIGURE 4

Comparison of Domestic, Import & Export Prices for Telephone & Telegraph Equipment, 1985-89



Source: Bureau of Labor Statistics

Table 2

Value of U.S. Manufacturers' Factory Shipments of Selected Telecommunications Equipment, 1984-89

Equipment	1984	1985	1986(r)	1987(r)	1988(r)	1989(e)	CAGR*
	Millions of Dollars						Percent
Private Branch Exchange	1,604	1,721	856	1,222	1,300	1,450	-2.0
Central Office Switches	2,857	4,333	4,472	4,442	4,500	4,650	10.2
Other Switching Equipment	1,410	1,661	1,852	1,816	1,850	1,865	5.8
Key Telephone Systems	895	880	876	882	878	950	1.2
Common Carrier Line Equipment	1,917	2,329	2,833	2,737	2,745	2,750	7.5
Telephone Sets (all types)	847	1,219	790	1,003	1,025	1,050	4.3
Teleprinters	663	474	361	325	175	150	-25.8
Voice Frequency Equipment	302	328	243	196	150	175	-10.3
Fiber Optics Equipment	254	529	637	701	755	800	-25.8
Radio Communications Link	1,678	1,953	1,887	1,765	1,543	1,600	-1.0
Mobile Radio Comm. Systems (including cellular radio systems)	1,818	1,782	2,139	2,567	2,772	2,890	9.7
Facsimile Equipment	100	64	49	38	23	28	-22.5
Data Communications Equipment:							
Modems	1,117	1,047	1,229	1,078	1,155	1,200	1.4
Multiplexors	1,407	1,644	1,750	1,801	1,892	2,000	7.3
Other Data Comm. Equipment	830	648	765	972	1,180	1,225	8.1
Other Telecommications Equipment	2,001	2,305	2,276	2,455	3,598	4,550	17.9
Total Telecom. Equipment	19,700	22,917	23,015	24,000	25,541	27,433	6.8

(r) Revised
(e) Estimated by NATA Market Research Department
* Compound Annual Growth Rate

Source: Based on Data of the U.S. Department of Commerce

Table 3

Miscellaneous Industry Information Related to the Production of Telecommunications Equipment

Item	1984	1985	1986	1987	1988	1989(e)	CAGR* Percent
Shipments: $ millions	19,700	22,917	23,015	24,000	25,541	27,433	6.8
Year-end Inventories: $ millions	5,876	6,250	6,336	6,375	6,410	6,300	1.4
New Capital Expenditurers: $ millions	1,350	1,246	1,123	1,175	1,238	1,450	1.4
Cost of Materials: $ millions	12,500	12,301	11,081	11,000	10,500	11,000	-2.6
Value Added by Manufacture: $ millions	9,999	14,469	18,396	21,040	23,760	24,000	19.1
Total Employment: 1,000s	234	239	223	213	212	250	1.3
Production Workers: 1,000s	131	128	110	106	106	110	-3.4
Average hourly Wage: $	12.09	12.08	11.94	12.19	12.25	13.00	1.5
Value Added per Employee: $ thousands	64	62	66	68	66	68	1.2

(r) Revised
(e) Estimated by the NATA Market Research Dept.
* Compound Annual Growth Rate

Source: Based on Data of the U.S. Department of Commerce.

Table 4

Selected Operating and Financial Ratios for the Communications Equipment Producing Industry; Computer and Other Office; and All Manufacturing for 1987

Item	Communications Equipment	Computers et al.	All Manufacturing
Capacity Utilization (percent of total capacity)	85.0	74.0	69.5
R & D as a percent of Net Sales	6.6	12.0	N/A
Advertising as a percent of Net Sales	1.5	1.4	1.6
Current Ratio (Current Assets to Current Liabilities)	1.8	1.8	1.4
Quick Ratio (Liquid Assets to Current Liabilities)	0.9	1.1	0.9
Net Assets to Working Capital	3.7	2.7	N/A
Asset Turnover	0.7	0.6	1.0
Liabilities to Net Worth	2.4	1.5	1.4
Debt Ratio (Total Debt to Total Assets)	70.2	60.6	58.0
Return on Assets	4.9	10.7	7.5
Return on Equity	7.6	8.6	5.0
Retained Earnings to Net Income	45.3	36.2	25.0

Source: Almanac of Business and Industrial Financial Ratios: 1988 edition; Prentice Hall.

Table 5

Various Price Indices for Certain Telecommunications Equipment, 1985-1989

Index	1985	1986	1987	1988	1989*
			Percent		
Producer Price Index:					
Telephone and Telegraph Apparatus	100.0	104.0	108.0	108.3	111.0
Central Office Switches	100.0	101.6	108.3	105.7	101.3
Private Branch Exchanges (PBX)	100.0	99.7	96.7	96.1	96.4
Less than 400 Line PBX's	100.0	99.2	93.7	94.3	95.8
400 Lines and over PBX's	100.0	100.0	99.5	93.6	N/A
Data Communications Equipment	100.0	99.0	98.5	100.7	101.1
Telephone Sets	100.0	93.2	90.5	92.3	89.8
Key Sets	100.0	100.0	97.0	103.2	103.2
Other Sets	100.0	99.0	84.0	78.2	76.0
Export Price Index for Telephone and Telegraph Equipment	100.0	100.8	103.0	106.9	109.3
Export Price Index for Radio and Television Communications Equipment	100.0	99.1	99.4	100.8	103.8
Import Price Index for Telephone and Telegraph Equipment	100.0	99.6	108.2	109.5	108.2
Import Price Index for Radio and Television Communications Equipment	100.0	110.1	113.1	115.2	114.0

* As of July 1989

Source: Bureau of Labor Statistics

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FOREIGN TRADE

OVERVIEW

Over the past decade, international trade in merchandise has become very important to the health of the U.S. economy. Not very long ago, trade turnover (imports plus exports) accounted for less than five percent of the gross national product (GNP). In 1988, trade turnover, a measure of total trade activity, accounted for 13 percent of GNP. As international trade--both imports and exports--becomes more critical to the U.S. economy, the problems of managing our trading relationships becomes more difficult. In a nation such as the United States, which is built on free enterprise in goods and services, the concept of hands-on management of trade becomes a thorny issue.

Because the United States is generally oriented towards free trade and has relatively low barriers to imports, foreign producers are able to sell successfully here. The reciprocal, however, is often not true, and U.S. producers are frequently not given the same market opportunities abroad. This leads to trade imbalances that are caused not by economic factors such as comparative advantages in raw materials, etc., but by parochial political concerns. This situation has been behind much of the current political pressure on the U.S. government to take a more active role in managing trade relations.

The international trade environment in telecommunications is one example of an industry where, for certain countries, political concerns outweigh economic concerns. For most types of telecommunications products, especially those used by consumers and businesses, the United States has a relatively open and competitive marketplace and imported products have done well. In many foreign countries, U.S. producers have found restrictive barriers to trade. As a result, the U.S. trade balance in telecommunications equipment was negative throughout 1984-88, worsening from minus $1.2 billion to minus $2.6 billion during the period (see Fig. 5). The deficit is expected to stabilize in 1989 and to remain around $2.6 billion, before beginning to edge downward as exports are stimulated. The continuing bright spot remains the trade surplus with the European Community, which increased from $326 million in 1987 to $417 million in 1988 (although, total U.S exports to the EC represent a small part of the EC's $50 billion telecommunciations equipment market). Tables 7 through 20 present product-specific figures reflecting trade activity with our major trading partners.

Clearly, the trend in U.S. trade patterns is reflective of the types of products U.S. producers manufacture, the openness of foreign markets, the openness of the U.S. market, and international economic and financial climates. U.S. producers manufacturer mainly high-end, high-technology products. For those products, U.S. producers have been relatively successful both here and abroad. Import penetration in the U.S. marketplace is principally in low-end, consumer-oriented products. For the most part, this segment has been abandoned by U.S. producers as relatively unprofitable.

International trade in telecommunications equipment depends on a variety of factors. Exchange rates, customs duties, historical trading relationships, and general economic conditions are significant determinants of international trade. Until recently, changes in the exchange rate, for instance, have tended to stimulate U.S. exports. The U.S. dollar decreased by almost 40 percent in value against a composite, trade-weighted, average of the currencies of our major trading partners since 1984. Recently, the dollar has begun to edge up vis-a-vis the currencies of our major trading partners, but nonetheless, U.S. exports continue to remain in a relatively good price position abroad.

Despite these factors, one of the most important factors influencing trade in telecommunications is government intervention motivated by political concerns. Most countries around the world have government-owned telecommunications authorities that provide telecommunications services to the public. These companies, frequently called PTTs (Post, Telephone, and Telegraph), are the largest and sometimes, the only major purchaser of telecommunications equipment. PTTs usually favor domestic suppliers and foreclose international competition. Other nontariff barriers erected by the government, such as stringent certifications procedures, import licenses, subsidies, etc., limit the amount of foreign participation in the local telecommunications equipment market. The situation is beginning to change, however, as PTTs begin to liberalize their purchasing decisions.

This has been particularly evident in Europe, and to some degree in Japan, where NTT, the monopoly local exchange service provider, was privatized several years ago. In addition, the Mexican government recently announced they would sell 51 percent of the Mexican PTT. In these and other countries the various governments are relaxing their grip on their local telecommunications marketplace for several reasons, including pressure by users wanting a wider variety of equipment unavailable from indigenous suppliers, and the dawning realization by the foreign governments that a competitive domestic environment forces local suppliers to be more efficient and thus better able to compete in the global marketplace.

For the European Community (EC), this issue of increased efficiency is critical as the EC moves closer towards a single integrated economic marketplace, scheduled for implementation by yearend 1992. By then, European producers will be introduced to a level of competition in their home market that they have never faced and those that cannot compete will undoubtedly lose market share and experience reduced profitability.

MANAGING TELECOMMUNICATIONS TRADE

Because the U.S. economy relies heavily on free-market mechanisms, the management of trade by the U.S. government is not a coherent industrial policy. It is instead a system of ad hoc reactions to specific problems. The result is that trade management is very fragmented and cumbersome and involves competing interests. For telecommunications, there are 17 Congressional subcommittees responsible for creating a framework for trade policy within which 10 executive agencies operate.

The executive agencies that are responsible for most of the governmental activities regarding trade in telecommunications include the Office of the U.S. Trade Representative (USTR); the Departments of Commerce, State, Treasury, Defense, and Justice; the International Trade Commission (ITC), the Small Business Administration, the Export-Import Bank, and the International Development and Cooperation Agency. Together, these agencies manage the day-to-day responsibilities of ensuring that U.S. trade policy has the effect of stimulating the competitiveness of U.S. industries through the management of trading relationships that are not always based on reciprocal market opportunities.

Several recent activities highlight the complex nature of U.S. telecommunications trade policy. The AT&T dumping case provides insight into how the Department of Commerce (Commerce) and ITC conduct an antidumping investigation. In essence, the procedure, which will take about 11 months to complete, requires Commerce and ITC to conduct two investigations each to determine whether or not to impose dumping duties on imports of small business telephone systems from Japan, Korea, and Taiwan. The ITC completed its first investigation on February 13, 1989, and decided that the case should continue. Commerce finished its first investigation on July 26, 1989, and its final investigation on Japan and Taiwan on October 10, 1989 (Commerce's final decision for Korea has been postponed until the end of December). Commerce determined high dumping margins (the difference between the U.S. selling price and the "fair market price") for Japanese and one Taiwanese producer (all other Taiwanese producers were found to have 0.00 margins). In Commerce's preliminary investigation Korean producers received relatively low dumping margins.

The impact of a decision affirming the AT&T/Comdial allegations will be a redistribution of market share among the major players. In the short term, prices will stabilize and probably inch up a bit, perhaps by as much as 10-15 percent. However, that will be short lived, and within a year or so prices will begin to fall again. The main losers are the small Japanese producers and their U.S. distributors that will be subject to high dumping duties, and do not have the resources to shift production to the United States or to a third country.

Other significant developments include the recent enactment of the Omnibus Trade and Competitiveness Act of 1988. This act has targeted telecommunications as a strategic industry and has imposed various measures to ensure that U.S. producers are afforded the maximum import relief in the U.S. market, within the bounds of a relatively free trade environment. In addition, the Act attempts to ensure for the U.S. industry, to the extent possible, greater market access abroad. As part of this effort, the USTR is required to review existing trade agreements, including a 1986 agreement with Japan designed to open access to the Japanese market to U.S. companies. On May 8, 1989, the USTR found that the Japanese had not lived up to the agreement and threatened punitive actions. At the eleventh hour, the Japanese sent a negotiator and the issue was resolved.

In addition, on January 1, 1989, the United States and Canada began implementation of an historic free trade agreement crafted to eliminate virtually all tariff and nontariff barriers to trade between the two countries within 10 years. In telecommunications, the timetable will be faster, with most trade barriers to be eliminated within five years. This will provide significant advantages to producers of equipment and services on both sides of the border, since there are already common telecommunications network standards and virtually no adaptations are required.

Other important activities include the U.S. participation in various international forums that have as their goals the global harmonization of telecommunications standards, trade policy coordination with the aim of reduced trade barriers, cooperation in international financial and economic policy matters, and a general trend towards increased economic and political interdependence. These forums include the General Agreement on Tariffs and Trade (GATT), the International Telecommunications Union (ITU), the Organization for Economic Cooperation and Development, and other similar organizations.

Overall, the U.S. trading environment is on a course based on free trade under the condition of reciprocity in market access abroad. Despite occasional setbacks, this tracks with international developments. The global trading environment is gradually becoming more fair and open as governments around the world realize that economic gains can be achieved through freer competition. This trend bodes well for U.S. producers, since they are already in a highly competitive environment and can translate that experience to markets abroad. With the right mix of products, management insight, and strategic goals, U.S. companies should be able to capitalize on the emerging global marketplace and make significant inroads into areas was once considered impenetrable.

IMPLICATIONS

International trade in telecommunications is becoming a top issue in government trade regulation policy forums and is being argued at the highest levels of government. There are two seemingly divergent trends in government attitudes towards the management of trade. The trade idealists want no management of trade whatsoever. The more pessimistic telecommunications trade analysts argue that the U.S. has already made tremendous unilateral concessions with the divestiture of AT&T, and that trade needs to be heavily managed to maintain for U.S. producers the portions of the market in which they can still compete. There are evidences of both trends, but the synthesized policy that has developed basically represents a pragmatist's approach to trade: the management of trade to the extent necessary to achieve the maximum economic benefits possible to all parties given that the international trading environment is frequently ruled by political concerns rather than economic concerns. In essence, U.S. policy has evolved based on trying to reduce U.S. trade imbalances that are a result of an inequitable trade environment.

While probably a more rational approach than either extreme, there are still risks in this approach. Several of our trading partners are becoming disillusioned by our seeming ambivalence with respect to the implementation of telecommunications trade policy. Two cases in point are Japan and the EC.

The U.S. has made Japan the object of virtually every conceivable trade action. As a result, despite the fact the United States is by far their biggest customer, the Japanese are becoming as frustrated with the trade relationship as we are. In addition, the political climate in Japan is beginning to change. The initial readings of this change suggest a more protectionist, less conciliatory trade environment. It seems likely, therefore, that the trade relationship with the Japanese will not improve in the near term.

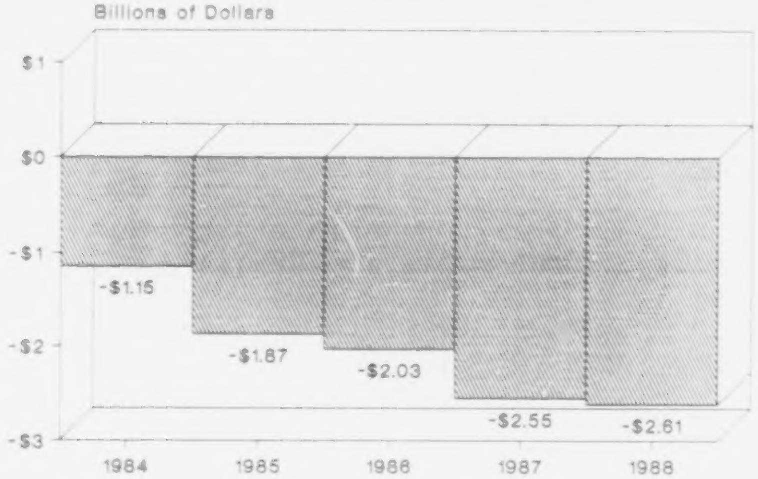
However, an out-and-out trade war is not likely. Each has too much economic interest vested in the other. We are dependent on them for the money they spend in the United States financing the national debt. Moreover, we are dependent on them for certain strategic products no longer made in the United States, especially electronic components. In addition, they are dependent on us as the biggest market for their products and the safest and most profitable haven for their excess cash.

As for the European Community, it is in the middle of one of the most significant economic developments in recent memory--the integration of the EC into a single market. In the best of times, the U.S.-EC trade relationship has not always been harmonious. Most of the transatlantic arguments have been over agriculture, but the EC countries have shown that they are not averse to trade friction. The United States has recently named the EC as a priority country for negotiations in telecommunications trade issues. The Europeans have indicated that they think that our reasons for naming them are groundless. With the integration of the EC economies, the Europeans will have in their own backyard the largest market in the world. There will be even less incentive for them to defer to us. Still, all-in-all, the relationship will probably remain relatively smooth. Again, there are too many vested economic and political interests to allow the relationship to get too stormy.

Despite the possible risks of this pragmatic approach to trade management, the global trading environment is probably on an upswing in terms of cooperation and barrier reductions. The three most hopeful signs are the U.S.-Canada FTA; the removal of the barriers between the EC countries (unheard of, even as a remote possibility, not long ago); and the Uruguay Round of trade negotiations (a new round of multilateral trade negotiations, currently underway under the auspices of the GATT. These signs point to a global economy that is becoming more and more intertwined.

FIGURE 5

U.S. Trade Balance in Telecommunications Equipment, 1984-1988



Source: U.S. Department of Commerce

Table 6

U.S. Imports of Telecommunications Equipment, 1984-1988

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	3,694	553	753	691	4,365
Denmark	5,923	4,234	3,262	2,309	4,047
France	48,502	94,490	41,181	73,549	130,556
Germany, West	34,352	49,772	44,891	49,761	73,260
Greece	1,225	792	1,741	1,178	1,671
Ireland	2,253	4,702	7,922	7,786	7,570
Italy	6,054	21,641	17,572	42,938	43,280
Netherlands	6,178	18,362	14,137	6,793	37,649
Portugal	3	25	20	189	94
Spain	3,987	14,516	14,367	2,417	1,340
United Kingdom	33,425	46,641	64,774	55,050	66,482
Total EC	145,596	255,728	210,617	242,662	370,315
East Asia					
Hong Kong	266,990	197,651	307,026	342,966	471,307
Japan	1,625,421	2,008,603	2,051,689	2,388,546	2,484,012
Korea, South	162,284	233,553	337,032	512,019	515,578
Singapore	142,121	207,579	260,861	355,364	500,648
Taiwan	373,442	458,127	586,783	721,127	698,288
Total East Asia	2,570,258	3,105,512	3,543,393	4,320,022	4,669,833
Canada	412,420	549,711	483,193	453,317	616,517
Mexico	108,758	196,634	209,484	238,884	259,626
Sweden	93,796	66,958	82,482	74,630	65,360
All Other	141,191	183,004	209,751	284,873	467,761
World	3,472,019	4,357,547	4,738,921	5,614,387	6,449,411

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 7

U.S. Imports of Telephone Sets, All Types Except Cordless and Cellular, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	6	7	6	21	0
Denmark	1,420	273	204	43	26
France	656	6,879	1,171	901	2,184
Germany, West	651	4,835	6,565	5,905	9,957
Ireland	0	8	80	537	75
Italy	169	96	133	363	609
Netherlands	0	241	16	32	29
Spain	3,291	13,414	13,895	711	29
United Kingdom	640	1,117	5,341	5,961	5,846
Total EC	6,833	26,868	27,411	14,474	18,755
East Asia					
Hong Kong	97,770	60,423	107,884	111,123	133,842
Japan	190,172	176,422	370,953	340,460	256,927
Korea, South	43,453	71,999	99,333	141,262	124,524
Singapore	10,031	18,985	60,616	98,455	111,809
Taiwan	137,372	117,283	247,279	215,070	155,539
Total East Asia	478,798	445,111	886,065	906,370	782,641
Canada	10,447	24,538	25,076	27,275	37,267
Mexico	9,160	3,026	2,517	1,809	4,468
Sweden	319	418	5,145	1,424	2,743
All Other	1,971	671	16,385	35,861	81,516
World	507,526	500,632	962,599	987,213	927,390

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 8

U.S. Imports of Facsimile Equipment, 1984-88

Country	*1984	*1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg			18	0	0
Denmark			5	0	4
France			2	145	93
Germany, West			384	12	73
Italy			0	35	17
Netherlands			2	2	9
Spain			3	0	0
United Kingdom			549	543	151
Total EC			963	737	347
East Asia					
Hong Kong			31	16	321
Japan			210,141	496,123	893,946
Korea, South			1	425	2,087
Singapore			0	111	18,756
Taiwan			24	974	1,761
Total East Asia			210,197	497,649	916,871
Canada			156	390	311
Mexico			7	188	168
Sweden			123	2,298	40
All Other			59	34	155
World			211,505	501,296	918,092

* Not Available

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 9

U.S. Imports of Cordless Telephones, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Denmark	0	1	0	0	5
France	1	64	4	2	38
Germany, West	68	21	0	79	4
Italy	271	0	0	0	54
Netherlands	1	0	2	0	0
Spain	329	0	0	6	0
United Kingdom	9	47	14	1,001	134
Total EC	678	86	19	1,087	235
East Asia					
Hong Kong	76,220	41,533	55,993	72,536	109,943
Japan	62,420	37,759	40,782	63,332	80,809
Korea, South	50,974	16,339	40,474	92,274	71,915
Singapore	13	212	3,553	40,811	66,548
Taiwan	80,757	73,309	85,400	86,804	66,267
Total East Asia	270,385	169,152	226,202	355,756	395,482
Canada	32	416	8	4	40
Mexico	0	0	0	0	281
Sweden	6	15	0	7	0
All Other	19	93	2,632	2,084	6,905
World	271,120	169,763	228,861	358,938	402,943

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 10

U.S. Imports of Telecommunications Switching Equipment, 1984-88

Country	*1984	*1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	707	0	0	0	108
Denmark	125	205	58	27	8
France	6,192	27	3	2,034	1,333
Germany, West	353	15,175	4,519	8,738	15,664
Ireland	330	1,954	531	2,138	2,024
Italy	160	30	79	352	927
Netherlands	40	6	277	56	17
Portugal	1	610	37	0	0
Spain	6	87	7	0	0
United Kingdom	4,182	2,379	1,941	590	2,078
Total EC	12,095	20,473	7,451	13,935	22,159
East Asia					
Hong Kong	1,953	904	911	1,567	603
Japan	328,660	206,111	127,556	103,068	67,794
Korea, South	10,055	21,419	5,152	12,578	14,689
Singapore	666	10	66	30	2,317
Taiwan	14,404	12,351	6,451	4,814	7,813
Total East Asia	355,738	240,795	140,136	122,057	93,216
Canada	166,058	215,577	148,796	160,794	181,109
Mexico	6,648	9,130	7,832	7,395	12,647
Sweden	13,613	18,526	3,525	29,690	20,914
All Other	13,623	21,030	19,276	11,883	22,423
World	567,775	525,531	327,016	345,754	352,468

* Includes imports of key telephone systems.

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 11

U.S. Imports of Telephone Answering Machines, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	0	0	0	10	7
Denmark	0	0	0	0	3
Germany, West.	1	0	75	194	135
Spain	117	4	5	0	0
United Kingdom	4	6	53	11	160
Total EC	122	10	133	215	305
East Asia					
Hong Kong	34,126	37,283	64,092	58,785	46,609
Japan	119,298	97,444	120,042	82,101	69,852
Korea, South	18,484	43,848	66,428	82,992	83,620
Singapore	10,697	20,179	23,159	43,412	92,368
Taiwan	2,432	967	2,872	14,025	24,878
Total East Asia	185,037	199,721	276,593	281,315	317,327
Canada	69	80	114	212	590
Sweden	9	2	0	0	0
All Other	17	142	1,311	2,137	60,919
World	185,254	199,955	278,151	283,879	379,141

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 12

U.S. Imports of Cellular Telephones, 1984-88

Country	*1984	*1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Denmark			4	4	76
France			0	88	3
Germany, West			1	2	4
Netherlands			0	0	1
United Kingdom			2,771	3,961	2,383
Total EC			2,776	4,055	2,467
East Asia					
Hong Kong			15,290	18,761	74,452
Japan			53,899	120,987	88,499
Korea, South			22,583	45,043	55,401
Singapore			6	4,657	32,015
Taiwan			386	11,824	23,735
Total East Asia			92,165	201,273	274,102
Canada			1,001	6,423	1,684
Mexico			393	1,104	4
Sweden			8	31	8
All Other			7,810	6,530	4,057
World			104,153	219,416	282,322

* Not Available

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 13

U.S. Imports of Key Telephone Systems, 1984-88

Country	*1984	*1985	1986	1987	1988
			Thousands of Dollars		
European Community:					
Belgium and Luxembourg			0	4	1
France			30	0	297
Germany, West			3,222	7,070	12,378
Italy			0	16	0
Netherlands			5	0	0
United Kingdom			80	1,422	1,441
Total EC			3,338	8,512	14,117
East Asia					
Hong Kong			257	50	2
Japan			37,432	22,397	22,745
Korea, South			22,636	31,755	33,215
Singapore			0	2	0
Taiwan			6,494	10,969	6,664
Total East Asia			66,820	65,173	62,626
Canada			8,969	4,916	1,656
Mexico			1,635	90	272
Sweden			406	0	0
All Other			18	180	156
World			81,185	78,871	78,828

* Not Available

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 14

U.S. Imports of Communications Satellite Equipment, 1984-88

Country	*1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg		0	73	3	0
Denmark		0	0	1	0
France		44,044	0	27	486
Germany, West		4,180	11,018	4,600	13
Italy		0	373	500	225
Netherlands		0	50	0	0
United Kingdom		1,374	1,602	208	491
Total EC		49,598	13,117	5,341	1,214
East Asia					
Hong Kong		0	49	67	6
Japan		109	544	3,139	3,165
Korea, South		0	7	251	176
Singapore		0	2	0	0
Taiwan		149	183	345	483
Total East Asia		259	786	3,802	3,830
Canada		682	1,719	3,059	4,887
Mexico		0	2	10	2
Sweden		0	1	0	3
All Other		4	300	81	255
World		50,543	15,924	12,292	10,191

* Not Available

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 15

U.S. Exports of Telecommunications Equipment, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	13,423	20,020	27,670	20,699	38,567
Denmark	8,273	11,778	4,989	7,243	8,603
France	41,750	44,075	38,472	42,678	60,297
Germany, West	94,224	102,228	108,821	103,587	128,415
Greece	3,893	3,745	4,284	9,125	23,113
Ireland	18,479	8,181	8,797	8,315	10,074
Italy	34,090	36,120	35,976	44,850	71,202
Netherlands	30,038	71,267	83,626	79,051	90,691
Portugal	2,589	1,899	5,248	6,394	10,807
Spain	19,890	30,778	21,286	21,841	32,946
United Kingdom	150,914	179,347	191,245	225,381	313,099
Total EC	417,564	509,438	530,413	569,166	787,814
East Asia					
Hong Kong	44,478	39,560	49,291	58,761	92,927
Japan	74,283	106,185	138,655	175,485	263,151
Korea, South	141,318	132,989	103,707	68,321	151,906
Singapore	38,062	32,573	36,127	65,335	87,355
Taiwan	70,831	84,926	101,191	173,754	188,218
Total East Asia	368,973	396,233	428,972	541,656	783,557
Canada	256,858	246,547	250,790	331,740	431,911
Mexico	310,558	313,978	373,829	415,167	579,898
Brazil	85,380	109,769	211,853	286,420	345,369
All Other	881,507	915,281	912,493	920,452	912,484
World	2,320,839	2,491,245	2,708,351	3,064,600	3,841,033

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 16

U.S. Exports of Telephone Switching Equipment, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	4,989	3,774	7,940	5,661	6,085
Denmark	56	73	366	444	166
France	1,102	827	973	2,133	3,915
Germany, West	2,376	5,917	2,869	6,914	5,612
Greece	266	73	422	358	1,273
Ireland	7,814	940	1,766	1,960	1,200
Italy	7,554	8,218	4,709	3,738	8,197
Netherlands	9,670	53,766	51,953	29,267	61,205
Portugal	0	0	0	505	363
Spain	111	1,035	466	1,912	1,257
United Kingdom	24,190	28,075	26,981	25,541	56,601
Total EC	58,130	102,697	98,446	78,432	145,874
East Asia					
Hong Kong	7,012	10,226	11,980	10,011	13,120
Japan	7,764	15,132	45,433	35,178	63,810
Korea, South	85,860	53,494	29,800	19,648	54,258
Singapore	4,486	2,569	4,945	12,336	5,585
Taiwan	12,324	15,723	23,641	80,308	78,969
Total East Asia	117,445	97,144	115,799	157,480	215,742
Canada	52,028	49,721	46,129	57,979	65,944
Mexico	5,931	15,284	20,925	9,334	17,176
Brazil	762	1,642	1,905	4,006	2,532
All Other	164,936	96,185	111,138	104,445	98,904
World	399,234	362,673	394,342	411,677	546,172

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 17

U.S. Exports of Fiber Optics Equipment, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	657	1,092	795	456	529
Denmark	4	2	7	174	807
France	817	876	5,828	6,514	3,022
Germany, West	11,855	9,043	24,773	8,035	8,122
Greece	0	0	0	2	11
Ireland	0	0	0	0	87
Italy	1,821	1,767	1,329	1,245	6,078
Netherlands	54	164	3,791	3,953	646
Portugal	0	0	19	0	557
Spain	8	607	726	2,312	214
United Kingdom	5,501	4,544	4,016	4,561	4,664
Total EC	20,717	18,094	41,283	27,252	24,737
East Asia					
Hong Kong	53	0	2	26	46
Japan	483	4,416	2,897	10,695	9,747
Korea, South	1,015	441	128	282	182
Singapore	10	11	11	84	485
Taiwan	11	70	154	2,946	9,574
Total East Asia	1,572	4,938	3,193	14,031	20,034
Canada	1,732	5,396	10,219	13,435	10,983
Mexico	0	390	310	615	759
Brazil	1	134	300	331	38
All Other	2,248	5,514	12,798	9,610	27,275
World	26,270	34,465	68,102	65,274	72,843

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 18

U.S. Exports of Telephone Instruments, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	91	151	148	260	2,187
Denmark	24	38	66	42	29
France	67	471	146	290	667
Germany, West	417	152	259	530	2,004
Greece	48	21	48	247	157
Ireland	52	52	8	394	1,150
Italy	272	467	1,063	2,229	5,228
Netherlands	153	39	109	632	927
Portugal	1	10	1	39	90
Spain	1,435	2,337	1,869	52	599
United Kingdom	1,944	661	2,372	7,505	22,847
Total EC	4,504	4,397	6,088	12,219	35,885
East Asia					
Hong Kong	5,307	2,835	4,824	7,974	23,335
Japan	3,396	4,363	2,338	8,662	7,638
Korea, South	1,698	357	504	3,508	2,892
Singapore	567	288	395	1,334	6,674
Taiwan	1,251	2,831	3,815	3,530	3,075
Total East Asia	12,219	10,673	11,876	25,008	43,614
Canada	4,957	5,689	7,560	9,179	19,969
Mexico	1,045	1,107	2,152	1,281	4,771
Brazil	981	1,691	405	218	650
All Other	13,289	13,764	9,462	17,967	23,894
World	36,996	37,322	37,543	65,873	128,783

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 19

U.S. Exports of Modems, 1984-88

Country	*1984	*1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg			142	146	216
Denmark			56	11	48
France			1,182	1,456	3,986
Germany, West			808	389	540
Greece			81	14	7
Ireland			13	42	29
Italy			344	285	2,391
Netherlands			449	238	1,144
Portugal			19	28	0
Spain			26	2	55
United Kingdom			2,976	6,058	7,712
Total EC			6,096	8,667	16,110
East Asia					
Hong Kong			218	448	1,557
Japan			974	10,483	18,299
Korea, South			442	370	536
Singapore			179	403	745
Taiwan			118	405	874
Total East Asia			1,932	12,109	22,011
Canada			2,174	5,267	7,956
Mexico			1,064	1,918	2,725
Brazil			36	82	167
All Other			7,489	4,559	8,900
World			18,791	32,602	57,869

* Not available

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

Table 20

U.S. Exports of Teleprinters, 1984-88

Country	1984	1985	1986	1987	1988
	Thousands of Dollars				
European Community:					
Belgium and Luxembourg	230	203	28	52	1,181
Denmark	39	34	11	2	9
France	329	166	827	514	755
Germany, West	1,590	545	299	314	199
Greece	9	18	65	3	12
Ireland	17	44	10	64	206
Italy	1,233	530	60	180	318
Netherlands	1,093	977	173	26	53
Portugal	10	32	4	33	211
Spain	207	104	645	121	89
United Kingdom	1,492	2,050	1,294	580	794
Total EC	6,250	4,701	3,416	1,889	3,827
East Asia					
Hong Kong	188	147	132	393	450
Japan	11,170	559	654	559	845
Korea, South	27	562	195	223	126
Singapore	199	46	77	129	546
Taiwan	172	1,028	778	127	270
Total East Asia	1,756	2,342	1,836	1,432	2,237
Canada	3,892	4,891	4,665	5,928	5,656
Mexico	2,300	221	1,126	2,021	3,705
Brazil	78	13	0	118	183
All Other	8,832	4,524	5,948	7,062	8,081
World	23,107	16,693	16,990	18,450	23,689

Source: Compiled from official statistics of the U.S. Department of Commerce.

Note: Columns may not add due to rounding.

TELECOMMUNICATIONS SERVICES OVERVIEW

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The market for telecommunications services encompasses a wide variety of services, from simple "dial tone" to on-line data base access, packet switching, video conferencing, and private networks. The market can be divided into the services provided by fairly distinct and separate types of service providers--local exchange carriers, interexchange carriers, and specialized carriers such as information service providers.

The total market for telecommunications services in 1988 amounted to about $120 billion (see Fig. 6). Of that, the local exchange portion (includes intraLATA toll) amounted to $54 billion, long distance services amounted to $52 billion, special data communication services such as private packet switching services amounted to $3 billion, cellular services amounted to $2 billion, and voice messaging/processing and other call processing services amounted to $1 billion. By 1995, the telecommunications services market is expected to reach $175 billion. Much of the growth is likely to occur in the long distance segment (especially 800 and 900 services) as well as the rapidly expanding cellular, voice messaging, and audiotex segments. In the near term, the market for data communications services will also experience strong growth, but, as ISDN becomes widespread, the demand for data-specific communications services will moderate.

The U.S. telecommunications network links telephonic and computer equipment for voice, text, data, and video transmission. About 85 percent of the traffic on the public network is voice telephone communications; data traffic accounts for about 10 percent; and video and other specialized transmission account for the balance of domestic telecommunications. In 1988, about 430 billion telephone calls were placed over the public network, of which almost 90 percent were local. On average, each person makes about 2,000 calls a year, or almost 5.5 per day. Business customers account for about 20 percent of long-distance domestic telephone use, residential users account for 71 percent, while government and specialized users make up the balance. More than 63 percent of all calls are made during regular business hours. Nearly 94 percent of all households in the United States have telephone service.

Telecommunications service infrastructure investment currently accounts for more than 10 percent of gross fixed capital formation in the United States and Western Europe. This suggests the tremendous importance that the telecommunications network plays in activities of business and residential consumers.

According to a study conducted by **Networking Management** magazine, which gathered information from some 2100 companies with over 50 employees, the average telecommunications budget in 1989 amounted to $11.8 million, five percent above the 1988 average budget of $11.2 million. On average, 66 percent of the $11.8 million is budgeted for voice telecommunications and 34 percent for data communications.

In terms of a breakdown by industry, banks/financial institutions budgeted the most for 1989--$70.4 million. Companies that provide business services, on average, budgeted $22.7 million; utilities averaged $7.0 million; federal government agencies budgeted $5.0 million; state and local governments averaged $4.8 million; transportation companies budgeted $3.0 million; and insurance companies and wholesale/retail establishments averaged $2.5 million. Other industries surveyed include manufacturing, education, health care, and agriculture/mining/construction.

According to a study done by the International Communications Association of companies that spend at least $1 million per year on telecommunications, on average, large business telecommunications users spent .6 percent of their annual revenues on telecommunications, which represented .9 percent of their total operating expenses.

The composite Consumer Price Index (CPI) for all telephone service dropped .9 percent from March 1988 to March 1989. The CPI for local service dropped .8 percent during the same period, while intrastate toll service rates dropped 2.3 percent and interstate toll rates dropped .1 percent. Overall, from 1983, local rates have increased 44 percent, intrastate toll has dropped 3 percent, and interstate toll has dropped almost 30 percent. During the same time, the CPI for all items increased 22 percent. The overall price level for telephone service should be stable for the near term, as long distance rates dropped slightly, offsetting possible slight increases in local rates.

Since much of the telecommunications services industry is regulated, it traditionally has been guaranteed a certain rate of return. This however is changing as certain segments of the telecommunications services market becomes more competitive (local exchange carriers are, for the most part, still guaranteed a certain rate of return). Comparing 1987 with 1986 industry operating and financial ratios, it appears that there is an overall deterioration in the health of the industry (see Table 21). In 1987, the cost of operations as a share of net sales amounted to 33.8 percent, up from 28.9 percent for 1986. Net profit as a percent of net sales dropped from 5.9 percent in 1986 to 1.1 percent in 1987. Return on equity decreased from 4.7 percent to 2.9 percent.

Technological convergence has reduced the structural differences between the data processing and telecommunications industries, leading to overlapping markets and customers. The technical interaction of computing and telephony can be characterized by the functional allocation of processing "intelligence" within the telecommunications network. In the new generation of telephone technology, remotely distributed digital processors are programmed to function independent of central office switches without the centralized signaling instructions that have defined traditional network architecture. In addition, the network provides interconnection for CPE ranging from computer terminals with data processing capabilities to facsimile terminals, voice messaging systems, integrated voice-data work stations, and PBXs.

One of the key market developments in the past two years has been the testing of technical standards for the Integrated Services Digital Network (ISDN). By mid 1989, there were 53 ISDN trials conducted by a variety of different CO switch manufacturers and carriers (see Fig. 7). ISDN is directed primarily at the standardization of interfaces and services of a public digital network designed to provide an end-to-end digital pipeline for the transmission of voice, data, video, image, and text. In addition, aside from the wide variety of services that a user will be able to access, ISDN will provide users with direct control over the services. For instance, users will be able to initiate and terminate the services of their choice from their own terminals.

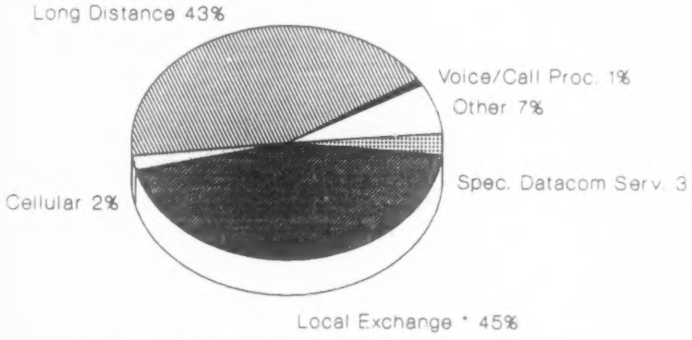
While many of the network standards have been established, the standards for terminal equipment have not. It is likely that ISDN will not be available on a wide-spread commercial basis for several more years. However, in the long run, most analysts believe that

ISDN will be a major economic and technological force driving competition in the telecommunications industry.

Others, however, feel that the customer does not want or need anything more than "plain old telephone service" (POTS), but nonetheless will be required to foot the bill for the development of ISDN, which will primarily benefit large business customers. Furthermore, critics argue that the full benefits of ISDN will not be realized until every potential household and business has subscribed and that may never happen.

FIGURE 6

1988 Telecommunications Services Market, by Type of Service



Total 1988 Market = $120 Billion

* Includes Intra-LATA toll service by local exchange carriers

Source: NATA Market Research Dept.

Figure 7

U.S. Companies Involved In ISDN Trials And Service Rollouts

Company	Switch	Access	Carrier	Status	Note
Aetna, Hartford, Conn.	AT&T 5ESS	Basic	SNET	Installation underway	
Alverno College, Milwaukee	Siemens EWSD	Basic	Wisconsin Bell	Started March 1988, ends 1989	Trial
American Express, Phoenix, Ariz.	AT&T System 85 PBX/4ESS	Primary	AT&T	Started July 1988	First customer of AT&T's Primary Rate.
American Transtech, Jacksonville, Fla.	AT&T System 85 PBX/4ESS	Primary	AT&T	Started Dec. 1987	Beta test site for AT&T's Primary Rate.
Arizona, State of, Phoenix	Northern Telecom DMS-100	Basic	US West	Started Nov. 1986, officialy ended	
Boeing Co, Seattle	AT&T 5ESS	Basic	US West	Scheduled Start Nov. 1988	
Carnegie Mellon University, Pittsburgh	AT&T 5ESS	Basic		Contract pending	
Chevron Corp., San Francisco	Northern Telecom SL-100/ DMS-100	Primary/Basic	Pacific Bell	Installation underway	
Contel Corp., Atlanta	AT&T 5ESS	Basic	Southern Bell	Started April 1988	Paying customer.
Control Data Corp., Minneapolis	NEC NEAX 61E	Basic	US West	Started Nov. 1987, ends Nov. 1988	Trial.
Duke University, Durham, N.C.	AT&T 5ESS	Basic	Southern Bell		
Eastman Kodak Co., Rochester, NY	Northern Telecom SL-100 PBXs	Primary		Started Aug. 1988	First Primary Rate using two SL-100s.
Federal National Mortgage Assoc., Washington	AT&T 5ESS	Basic	C&P Telephone	Started June 1988	
First Data Resources Inc. (American Express subsidiary), Omaha, Neb.	Northern Telecom SL-1 PBX and AT&T 4ESS	Primary	AT&T	Unannounced	
Glaxo Inc., Research Triangle Park, N.C.	SL-1 PBX and DMS-100	Primary/Basic	GTE South	Started June 1988	First Primary Rate/Basic Rate in one trial.
Hardees, Rocky Mount, N.C.	Northern Telecom DMS-100	Basic	Carolina Telephone	Scheduled start Jan. 1989	
Hayes Microcomputer Products Inc., Norcross, Ga.	AT&T 5ESS AT&T 5ESS	Basic Basic	Southern Bell Pacific Bell	Started April 1988 Sept 1987 to Sept 1988	Using ISDN to develop ISDN products.
Hershey Foods Corp., Hershey, Pa.	AT&T 5ESS	Basic	Contel of Pennsylvania	Scheduled start Oct. 1988	Will include ISDN satellite transmission.
Honeywell Information Systems (Honeywel Bull), Minneapolis	Northern Telecom DMS-100	Basic	US West	Started Jan. 87, officially ended between office and employees at home.	Applications included data/voice transmission
Intel Corp., Chandler, Ariz.	AT&T 5ESS	Basic	US West	Started Feb. 87, ended Aug. 1987	Trial.
John Hopkins Medical Center, Baltimore	AT&T 5ESS	Basic	C&P of Maryland	Contract pending	
Lawrence Livermore Laboratory (University of California), Livermore, Calif.	AT&T 5ESS	Basic	AT&T Federal Systems		
Lockheed Missiles and Space Co. Inc., Sunnyvale, Calif.	AT&T 5ESS	Basic	Pacific Bell	Started Sept. 1987, ended Sept. 1988	Trial.
Mass. Institute of Tech., Cambridge	AT&T 5ESS	Basic		Scheduled cutover Oct. 1988	Using AT&T 5ESS as PBX for private network.
Mather Air Force Base, Sacramento, Ca.	AT&T 5ESS	Basic	AT&T Federal Systems	Started Aug 1988	Model for ISDN development at 50 bases.
McDonald's Corp. Oakbrook, Ill.	AT&T 5ESS	Basic	Illinois Bell	Started Dec. 1986	
McDonnell Douglas Corp., St. Louis		Primary	AT&T	Unannounced	
Microcom Inc., Norwood Mass.		Basic	NET	Installation underway	Part of centrex contract.
Motorola Inc., Schaumburg, Ill.	Northern Telecom DMS-100	Basic	Illinois Bell	Planning stage	
NASA, Washington	AT&T 5ESS	Basic	AT&T Federal Systems		
Nice Corp., Odgen, Utah.	Northern Telecom SL-1s	Primary			Telemarketing company using private ISDN.
North Carolina State Univ., Raleigh	Northern Telecom DMS-100	Basic	Southern Bell		
Northeast Utilities, Hartford, Ct.	Northern Telecom SL-1s	Primary			PBXs in Rocky Hill Ct. and Meriden, Ct.
Pennsylvania, State of, Harrisburg	Northern Telecom DMS-100	Basic	Bell of Pennsylvania	Contract pending	Statewide network with ISDN in Harrisburg.
Pratt & Whitney, East Hartford, Conn.	AT&T 5ESS	Basic	SNET		
Prime Computer Inc., Natick, Mass.	AT&T 5ESS	Basic	Southern Bell	Started April 1988	Paying customer.
Rockwell Communication Systems, Richardson, Texas.	AT&T 5ESS with two remotes	Basic	Southwestern Bell	Scheduled start Dec. 1988 linked via ISDN.	40 buildings in a campus environment will be
Shearson Lehman Hutton Inc., New York	AT&T 5ESS	Basic	New York Telephone	Started June 1988	Part of 8,000 line centrex contract.
Shell Oil Co., Houston	AT&T 5ESS	Basic	Southwestern Bell	Start Sept. 1988	Plan to use 5,000 ISDN lines
Southern Methodist University, Dallas	Siemens EWSD	Basic	Southwestern Bell	Started Feb. 1988	
SunTrust Service Corp., Atlanta	AT&T 5ESS	Basic	Southern Bell	Started April 1988	Paying customer.
3M Corp., St. Paul, Minn.	AT&T 5ESS	Basic	Southwestern Bell	Started Aug. 1988	Plan to use 3,165 ISDN lines
Tenneco Inc., Houston	AT&T 5ESS	Basic	Southwestern Bell	Started June 1988	Plan to use 3,900 ISDN lines.
Texas A&M University College Station	GTE GTD-5 EAX	Basic	GTE Southwest		
University of Arizona, Tucson	AT&T 5ESS	Basic	US West	Planning Stage	Using AT&T 5ESS as PBX in private network.
University of Connecticut, Stoirs	AT&T 5ESS	Basic	SNET		
University of Indiana, Bloomington	Northern Telecom DMS-100	Basic	Indiana Bell		
University of Maryland, College Park				Unannounced	
University of South Florida, Tampa	AT&T 5ESS		GTE South	Started Oct. 1987	
U.S. Dept. of Treasury, Wash.				Contract pending	
U.S. Bank of Oregon, Portland	Northern Telecom DMS-100	Basic	US West	Started March 1987	Trial
Virginia, State of, Richmond	AT&T 5ESS	Basic	C&P of Virginia	Started April 1988	
West Virginia University, Morgantown	AT&T 5ESS	Basic	C&P of West Virginia	Scheduled start Dec. 1988	Plan to use 660 ISDN lines.

Note: This chart was compiled by **Communications Week** with information provided by Teleos Communications Inc.., Eatontown, N.J. as well as from news releases and published reports. Carriers, switch manufacturers and their affiliate laboratories are not listed.

Table 21

Selected Operating and Financial Ratios for the Communications Industry* for 1987

Item	Ratio
Cost of Operations as a Percent of Net Sales	33.8
Advertising as a Percent of Net Sales	1.0
Net Profit as a Percent of Net Sales	1.1
Current Ratio (Current Assets to Current Liabilities)	1.1
Quick Ratio (Liquid Assets to Current Liabilities)	.8
Asset Turnover	.4
Liabilities to Net Worth	1.1
Debt Ratio (Total Debt to Total Assets)	51.7
Return on Assets	5.2
Return on Equity	2.9

* Includes all telecommunications service providers.

Source: Almanac of Business and Industrial Financial Ratios: 1989 Edition; Prentice Hall

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LOCAL EXCHANGE MARKET

OVERVIEW

The local exchange marketplace is comprised of the services provided by local exchange telephone companies (LECs). The LECs are monopoly service providers within franchised areas that operate in an environment governed by both state and national regulations. Companies which once comprised the Bell Telephone System can only provide services within and not between specific operating areas called Local Access and Transport Areas (LATAs). Each Bell Operating Company (BOC) may operate within more than one LATA. Within each serving area, a telephone company provides a variety of services. These services can be divided into two basic categories--exchange service and exchange access. Exchange access services connect customers to long distance carriers, while exchange services are the telecommunications services provided within the serving area. The services themselves range from simple dial tone service to specialized customer services and system features such as hunt groups, call waiting, call forwarding, and centrex services. In addition, in 1988, under certain conditions, BOCs were given permission to provide voice messaging services and gateways for certain other enhanced services.

In 1988, the total nationwide local exchange market (includes intraLATA toll) amounted to some $54 billion (see Fig 8). This can be divided into two general segments--residential and business markets. Overall, for all carriers combined, the residential market represents the largest piece, accounting for 57 percent of the total. (See Table 23 for a gauge of the relative size of the business and residential portions for the top 30 cities.) For the most part, the residential portion of the market is basic dial tone service. Some LECs offer certain advanced residential services, but they have been introduced relatively recently and household penetration is very low. These services, such as call forwarding, call waiting, voice messaging, etc., will likely grow in popularity and will provide the impetus for growth in the residential services segment.

In 1988, the business telecommunications services segment of the market amounted to $23 billion. At $9 billion, the largest portion of revenue from the business services market is derived from basic business lines used principally by small businesses in conjunction with a key system or single-line instruments. Other significant portions of the business telecommunications services segment include revenue from WATS (wide area telecommunications service) at $4 billion, centrex and payphone, each at $2.5 billion, private line service at $2 billion, and PBX trunk revenue at $1 billion. The balance is accounted for by a variety of services, including certain digital services, voice processing services, and gateway services, providing much of the momentum for near-term growth in the business segment of the telecommunications services market.

REGULATED LOCAL EXCHANGE CARRIERS

There are currently hundreds of companies across the United States that offer local telephone service. In general, they can be grouped into two categories--companies that were divested from AT&T in 1984, commonly called the Bell Operating Companies (BOCs), and the independent telephone companies such as GTE, Centel, Contel, etc. There are 22 BOCs grouped into seven regional holding corporations, commonly called RBOCs, and hundreds of independent telephone companies (see Table 24 for a listing of the top 150 LECs). The RBOCs control an estimated 80 percent or more of the local exchange business.

The seven RBOCs are Ameritech, Bell Atlantic, BellSouth, NYNEX, Pacific Telesis (commonly called PacTel), Southwestern Bell, and U.S. West. In 1988, total revenue of all RBOCs amounted to $73.1 billion, up from $70.0 billion reported in 1987 (see Table 22 and Fig. 10). At $29.2 billion, the largest source of revenue was from local service, followed by the $18.1 billion paid by long distance carriers for access to the local network. BellSouth and NYNEX earned the most total revenue; each earned more than $12 billion. In addition, the RBOCs continue to be profitable, the range of net income as a percent of revenue varied from a low of 10 percent for NYNEX to a high of 13 percent for PacTel and Southwestern Bell.

In terms of total revenue in 1987, the largest independent telephone companies were GTE ($15.4 billion), United Telecommunications ($3.0 billion), Contel ($2.9 billion), and Centel ($1.5 billion). Total estimated 1987 revenue of all independent telephone companies amounted to $32.5 billion (see Table 25). Of the top four, profitability varied greatly from a high of 11 percent of revenue for Centel to a low of minus 2 percent for United. Virtually all of the fluctuation in profitability is related to revenue and expenses from nonlocal exchange business.

Despite the continued and relatively stable profitability of local telephone service, the local exchange carriers are conducting business in an uncertain enviroment. Issues such as bypass, CPE distribution, ISDN, service pricing deregulation and regulation, enhanced services, MFJ constraints, sales agency, and international opportunities all provide the RBOCs and independents with a very complex environment (see section on public policy for a discussion of recent regulatory developments). As these companies begin to meet these challenges and opportunities, they will undoubtedly begin to derive more of their revenue from sources other than local telephone service. In fact, some estimates project that by 1995 only 65 percent of RBOC revenues will be derived from local exchange business.

BYPASS--One of the critical issues to regulated LECs is bypass. Businesses are beginning to bypass the services provided by the local operating company. Bypass is usually considered of two types--facility bypass and switched services bypass.

Facility bypass occurs when a customer elects to bypass some or all of the local telco's facilities with his own network and either ties into the network somewhere along the line, usually at the long-distance carrier's point of presence, or bypasses on an end-to-end basis. Local telcos usually divide facility bypass into switched facility bypass (bypass of switched facility) and private line bypass (bypass of private line facility). The total 1988 estimated loss to the telcos from facility bypass amounted to $1.6 billion.

Switched service bypass occurs when a customer uses a higher-capacity, telco-provided service or telco-leased private lines to bypass lower-capacity, higher-priced services. The total 1988 estimated loss to the telcos from switched service bypass amounted to $2.2 billion.

CPE DISTRIBUTION--All RBOCs have been active in CPE distribution. They have collectively achieved sales of some $1.8 billion--about 10 percent of the entire CPE marketplace (including all voice and data CPE). These sales have been achieved through in-house joint services/CPE marketing organizations and through acquisitions of independent distribution organizations, i.e., interconnects. While the RBOCs have had a some degree of success with CPE sales, the successes have been especially notable in their own region. They have been less successful outside their own region. In fact, Ameritech threw in the towel outside its own territory and recently sold its entire non-Ameritech-territory imbedded base of equipment. It seems clear that the RBOCs need to sell CPE, especially within their own region as part of a package of products and services that they offer to their customers. But, it is not clear that, as a profit center, they will be any more financially successful at selling CPE than other CPE vendors, especially outside their own regions, where they have no installed customer base. Further discussion of RBOC CPE activities is included in the section on CPE.

ISDN--As mentioned in the overview to the section on telecommunications services, ISDN is undergoing a number of trials throughout the country. For the RBOCs, ISDN penetration is gaining momentum. By mid 1989, the total number of ISDN lines in place exceeded 60,000. Southwestern Bell, and NYNEX have taken significant leadership roles, each with more than 15,000 ISDN lines. PacTel has been the least active with less than 1,000 ISDN lines.

Not only does the number of RBOC-sponsored ISDN trials continue to grow, the RBOCs are also beginning to lure large business customers to digital centrex with the promise that digital centrex is the gateway to ISDN services. As the progression towards ISDN continues, the RBOCs will continue to replace analog switches with digital switches. The percent of RBOC access lines served by digital switches increased from less than 25 percent in 1988 to about 40 percent in 1989. By 1992, it should exceed 60 percent.

SERVICE PRICING REGULATORY TRENDS--The pricing structure of most local telephone services is currently regulated by state public utility commissions (PUCs). LECs must file tariffs with their PUC explaining the service to be provided and the price structure for the service. If the PUC approves the tariff, the LEC can begin offering the service. An increasing number of PUCs are being persuaded that, at least for some local services, measured pricing, off-tariff pricing, and even totally detariffed pricing are measures needed to ensure that the local telco is able to remain financially sound in an increasingly competitive environment. In fact, the state of Nebraska seems to be a trend setter by removing all telcos from most PUC rate regulation. Fifteen other states have detariffed, at least some local services, and other states are considering similar action.

Efforts to increase the ability to offer flexible service pricing and/or measured service pricing are being made by all RBOCs. NYNEX has foregone some price increases in exchange for measured service in New York. Ameritech also achieved measured service (except for a three-year ban in Indiana). U.S. West has made significant progress, not just in Nebraska, but in New Mexico, and other states as well. Even the California PUC, a traditional stronghold of telephone regulation, has been moving toward pricing flexibility on nonessential services.

ENHANCED SERVICES--As part of recent deregulatory and reregulatory trends affecting the RBOCs, they have been allowed to offer certain enhanced services directly (without having to market through a separate subsidiary) providing they comply with certain nonstructural safeguards including the requirement of comparably efficient interconnection (CEI), which gives third party vendors the ability to interconnect to the network features necessary to provide the services under the same conditions. Each time an RBOC wants to offer an enhanced service directly it must file a CEI plan with the FCC. Figure 12 lists the RBOC CEI plans filed as of early 1989.

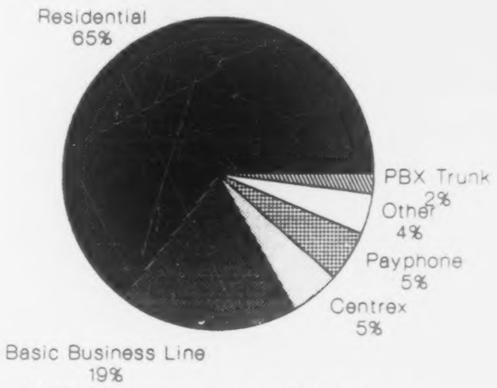
SALES AGENCY--Another competitive safeguard that has been required of the RBOCs wishing to sell equipment and certain business communication services together through a direct sales channel is the mandate that they must provide the opportunity to sell network services to independent sales agents. These independent agents, typically CPE vendors (i.e., interconnects), are chosen by the RBOC and are given specific network services they are allowed to sell. The agent earns a commission from the RBOC on the sale of the network services.

Though federally mandated, the sales agency program has delivered significant volumes in sales for several of the RBOCs. In 1988, independent agents brought in a total of $141 million in revenue to the RBOCs and $22 million in commissions for themselves. This is up considerably from 1987's $32 million to the telcos and $4.2 million in commissions. Initial indications for 1989 paint an even rosier picture. Revenues to the telco should amount to about $425 million, with commissions to the agents at about $65 million.

INTERNATIONAL OPPORTUNITIES--All of the RBOCs except Ameritech have organized international subsidiaries to explore the potential for profiting from activities in foreign markets. While the extent of the activity has been modest to date, the international forays are nonetheless strategically important. Unlike many of their activities in the Unites States, which are subject to regulation, the RBOCs see the potential to participate in more aspects of the telecommunications marketplace more freely abroad than they can here. Moreover, many markets abroad are growing more rapidly than in the United States. In addition, many foreign countries have a lower level of technology than the United States and need the expertise that the RBOCs can provide in order to develop a modern, sophisticated telecommunications infrastructure. A sound telecommunications infrastructure has been determined to be an absolute requirement to attract business investment and ensure a sound economy.

FIGURE 8

1988 Local Exchange Services Market, by Type of Service

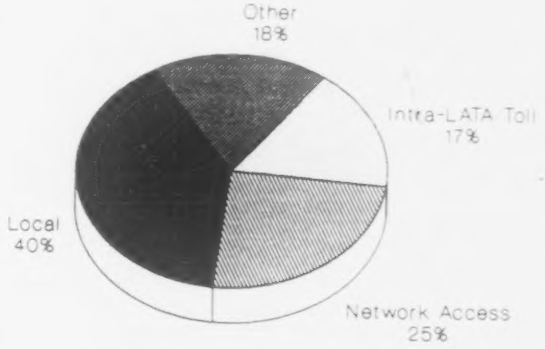


1988 Total Market = $54 Billion

Source: Estimated by the NATA Market Research Dept. based on various sources

FIGURE 9

1988 RBOC Revenue, by Source

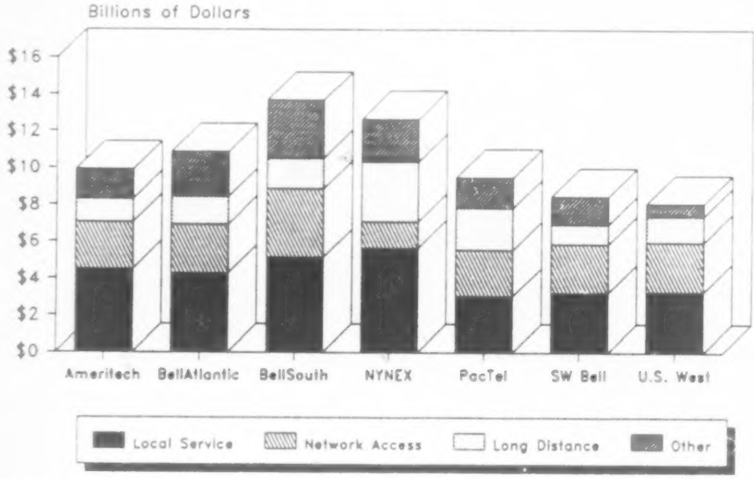


Total Revenue = $73.1 Billion

Source: Company Annual Reports

FIGURE 10

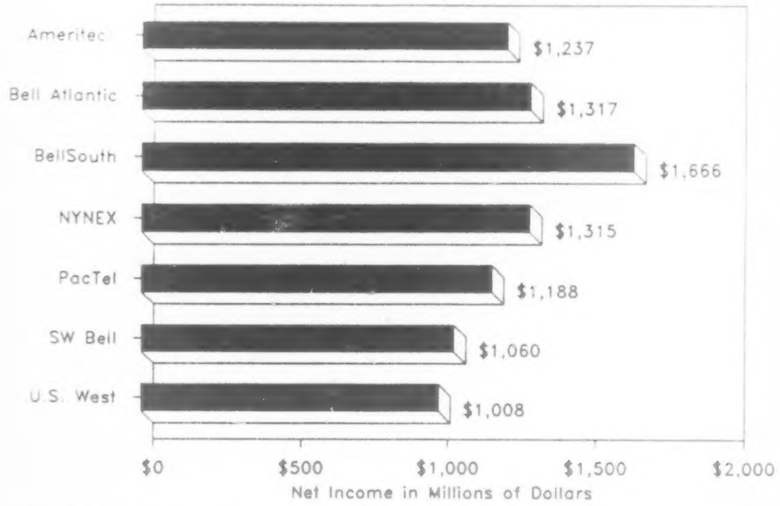
Revenue Breakdown by RBOC, 1988



Source: Individual Annual and 10K
Company Reports

FIGURE 11

Net Income By RBOC, 1988



Source: Individ. Annual and Co. Reports

Figure 12

RBOC CEI Plans As of February 1989

RHC	Name	Description	Location	Timetable
Bell Atlantic	Message storage service	Central office-based voice bulletin board, permitting subscribers to post announcements on dial-up basis.	Washington, D.C., Pittsburg and Philadelphia areas.	Filed 3/16/87; approved 1/14/88;trial started 8/88 in Washington, D.C.
	Voice messaging service	CO-based service allowing subscribers to record announcements, send and retrieve messages.	Germantown, Md., and Plainfield, N.J.	Filed 3/30/88; approved 9/20/88; trial scheduled fourth-quarter.
	Gateway service	A computer-based access point to electronic information services, including voice and data.	Washington, D.C., and Pennsylvania.	Filed 3/30/88; approved 9/23/88; trial scheduled fourth-quarter.
	Coin messaging service*	Permits pay telephone users to store messages for later delivery to a designated phone number.	300 pay telephones each in Washington DC, Philadelphia and New Jersey markets.	Filed 4/1/88; CEI waiver approved 9/16/88; trial scheduled 12/88.
Bell-South	Voice messaging service	Co-based service allowing subscribers to record announcements, send and retrieve messages.	Major metropolitan. areas.	Filed 3/18/88; trial scheduled fourth-quarter; approved 12/31/88.
	Gateway service	Computer-based access point to electronic information services, including voice and data.	Atlanta metropolitan area.	Filed 4/20/88; first commercial offering 8/88 through separate subsidiary; awaiting CEI approval.
	Synchronous protocol conversion	Computer-to-computer translation service through packet-switched network.	Pulselink service area.	Filed 8/19/88; awaiting CEI approval.
	Coin messaging service*	Permits pay telephone users to store messages for later delivery to a designated phone number.	300 pay telephones each in Atlanta, New Orleans and Memphis, Tenn.	Filed 10/7/88; awaiting CEI waiver.
NYNEX	Gateway service*	Computer-based access point to electronic information services, including voice and data.	Burlington, VT.	Filed 4/20/88, trial started 12/88 in Burlington, VT.
	Voice messaging service	Co-based service allowing subscribers to record announcements, send and retrieve messages.	Undetermined.	Filed 6/21/88; trial scheduled fourth-quarter; awaiting CEI approval.
Pacific Bell	Voice messaging service	Co-based service allowing subscribers to record announcements, send and retrieve messages.	Milpitas and San Pietro, CA two trials with residential/small business users; three with corporate users.	Filed 7/87; approved 1/14/88; trials scheduled-first quarter 1989.
	Electronic messaging service	Computer-to-computer messaging (text-to-text, text-to-voice, text-to facsimile) using X.400 protocol.	Undetermined.	Filed 6/20/88; trials scheduled fourth-quarter, awaiting CEI approval.
	Gateway service	Computer-based access point to electronic information service, including voice and data.	San Francisco Bay area.	Filed 9/23/88; trial scheduled mid-1989; awaiting CEI approval.
	Voice-store-and-forward service	CO-based service permitting deposit and retrieval of voice messages.	Undetermined.	Filed 11/18/88; awaiting CEI approval; commercial availability scheduled mid-1989.
South-western Bell	Voice messaging service	CO-based service allowing subscribers to record announcements send and retrieve messages.	St. Louis; Kansas City; Little Rock, AR; Oklahoma City, OK; Austin, Dallas/Fort Worth, Waco, TX.	Filed 4/1/88; approved 9/20/88; trials started 7/1.
	Gateway service*	Computer-based access point to electronic information services, including voice and data.	Houston.	Filed 8/24/88; trial scheduled March 1, 1989; awaiting CEI waiver.
	Protocol conversion	Computer-to-computer translation service through packet-switched network.	Major metropolitan areas.	Filed 12/12/88; awaiting CEI approval..
U S West	Voice messaging service	CO-based service allowing subscribers to record announcements and retrieve messages.	Undetermined.	Filed 5/13/88; awaiting CEI approval.

*Seeking waiver of CEI rules

Source: Enhanced Services Outlook, Feb. 1989
Telecom Publishing Group.

Table 22

Selected Financial Information of the Regional Bell Operating Companies
As of December 31, 1988

	Ameritech	Bell Atlantic	Bell-South	NYNEX	PACTEL	SW Bell	US West	Total or Average
Revenue: $ Millons	9,903	10,880	13,687	12,661	9,483	8,453	8,079	73,146
Local Service: $ millions	4,521	4,279	5,155	5,663	3,043	3,244	3,299	29,204
Network Access: $ millions	2,541	2,650	3,700	1,415	2,518	2,630	2,692	18,146
Long Distance: $ millions	1,240	1,492	1,677	3,251	2,277	1,068	1,412	12,417
Other: $ millions	1,601	2,459	3,155	2,332	1,645	1,511	675	13,378
Expenses and Income Tax: $ millions	8,282	9,183	12,021	11,417	8,295	7,393	7,076	63,667
Net Income: $ millions	1,237	1,317	1,666	1,315	1,188	1,060	1,008	8,791
Earnings per Share: $	4.55	6.65	3.51	6.63	2.81	3.53	6.17	4.83
Dividends per Share: $	2.76	4.08	2.36	4.04	1.76	2.48	3.52	3.00
Avg. Shares Outstanding: millions	272	198	474	198	423	300	183	292
Total Assets: $ millions	19,163	24,729	28,472	25,362	21,191	20,985	22,416	23,188
Long Term Debt: $ millions	4,487	6,557	7,031	6,241	5,475	5,039	6,465	3,899
Customer Access Lines: thousands	15.5	16.5	16.4	14.9	13.1	11.3	11.8	14
Number of Employees: thousands	77.3	79.0	100.3	97.4	69.7	64.9	69.8	79.8

Source: Individual Annual and 10K Company Reports.

Table 23

Residential and Business Telephones Installed In The Top 30 Metropolitan Areas, 1985, 1990, and 1995

City	1985		1990		1995	
	Residential (000)	Business (000)	Residential (000)	Business (000)	Residential (000)	Business (000)
Atlanta	715	375	865	409	942	446
Baltimore	1,153	410	1,264	450	1,309	466
Boston	299	251	353	300	382	325
Chicago	1,926	881	2,116	968	2,215	1,014
Cincinnati	550	234	625	266	656	280
Cleveland	655	258	707	278	723	285
Columbus	332	161	387	188	412	201
Dallas/Ft. Worth	907	293	1,080	349	1,176	380
Denver	1,186	499	1,336	613	1,466	691
Detroit	1,096	389	1,228	432	1,263	442
Houston	1,135	702	1,320	620	1,410	710
Indianapolis	477	199	544	228	568	238
Kansas City	325	194	364	218	428	229
Los Angeles	1,402	745	1,571	835	1,674	890
Miami	950	400	1,060	448	1,130	475
Milwaukee	619	255	677	279	707	292
Minneapolis/St. Paul	1,275	517	1,520	618	1,653	672
New Orleans	618	230	645	250	703	262
New York	4,056	1,825	4,344	1,954	4,520	2,033
Oklahoma City	587	242	690	285	750	310
Phoenix	1,211	400	1,640	543	1,907	632
Pittsburgh	554	264	605	288	625	298
Portland	343	202	404	244	440	269
Philadelphia	1,284	458	1,416	505	1,478	527
St. Louis	394	205	442	230	463	241
San Diego	411	234	513	293	571	326
San Francisco	521	420	592	478	636	514
San Jose	530	233	685	301	768	337
Seattle	452	295	554	362	606	395
Washington	549	624	634	722	679	773

Source: NATA Market Research Department.

Table 24

THE TOP 150

Largest Telephone Companies Reporting to USTA, Including Holding Companies

	In Order of Access Lines As of December 31, 1988	Access Lines	Operating Revenues
1.	**Bell Atlantic Corp. •** Philadelphia, Pennsylvania	16,541,000	9,730,300,000
2.	**BellSouth Corp. •** Atlanta, Georgia	16,407,000	11,806,085,000
3.	**Ameritech Corp. •** Chicago, Illinois	15,469,000	9,068,268,498
4.	**NYNEX •** New York, New York	14,851,000	11,111,200,000
5.	**Pacific Telesis Group •** San Francisco, California	13,093,000	8,906,374,245
6.	**GTE Corp. (US Only) •** Stamford, Connecticut	12,180,000	9,617,000,000
7.	**US West Communications •** Englewood, Colorado	11,878,000	8,078,900,000
8.	**Southwestern Bell Corp. •** St. Louis, Missouri	11,340,449	7,200,264,000
9.	**United Telecommunications, Inc. •** Overland Park, Kansas	3,685,337	2,509,700,000
10.	**Contel Service Corp. •** Atlanta, Georgia	2,470,000	1,989,683,881
11.	**Southern New England Telephone Co. •** New Haven, Connecticut	1,839,000	1,368,074,603
12.	**Centel Corp. •** Chicago, Illinois	1,503,192	858,353,000
13.	**ALLTEL Corp. •** Hudson, Ohio	1,084,283	733,600,000
14.	**Puerto Rico Telephone Co.** San Juan, Puerto Rico	768,367	540,332,023
15.	**Cincinnati Bell Telephone Co. •** Cincinnati, Ohio	763,439	561,072,123
16.	**Rochester Telephone Corp. •** Rochester, New York	558,825	321,757,906
17.	**Pacific Telecom, Inc. #** Vancouver, Washington	239,641	199,358,628
18.	**Telephone & Data Systems, Inc. †** Chicago, Illinois	239,636	141,934,834
19.	**Century Telephone Enterprises, Inc. •** Monroe, Louisiana	239,207	173,470,000
20.	**Lincoln Telephone & Telegraph Co. #** Lincoln, Nebraska	212,042	127,278,774
21.	**C-TEC Corp. #** Wilkes-Barre, Pennsylvania	177,000	105,969,000
22.	**Anchorage Telephone Utility** Anchorage, Alaska	115,264	87,917,616
23.	**Puerto Rico Communications Authority** San Juan, Puerto Rico	103,162	59,818,605
24.	**Citizens Utilities Co. #** Stamford, Connecticut	100,000	120,000,000
25.	**North State Telephone Co.** High Point, North Carolina	84,433	42,260,620
26.	**Illinois Consolidated Telephone Co.** Mattoon, Illinois	75,681	53,281,000
27.	**Concord Telephone Co.** Concord, North Carolina	72,465	26,360,000
28.	**Roseville Telephone Co. *** Roseville, California	65,741	48,876,046
29.	**North-West Telecommunications, Inc. #** Tomah, Wisconsin	63,110	31,463,907
30.	**Lufkin-Conroe Telephone Exchange** Lufkin, Texas	58,828	45,603,097
31.	**Universal Telephone, Inc.** Milwaukee, Wisconsin	46,938	23,009,589
32.	**Virgin Islands Telephone Corp.** St. Thomas, Virgin Islands	44,937	46,350,000
33.	**North Pittsburgh Telephone Co.** Gibsonia, Pennsylvania	41,473	30,825,862
34.	**Horry Telephone Coop., Inc.** Conway, South Carolina	38,882	17,466,280
35.	**Standard Telephone Co.** Cornelia, Georgia	38,814	25,374,866
36.	**Conestoga Telephone & Telegraph Co. *** Birdsboro, Pennsylvania	38,764	20,405,945
37.	**Denver & Ephrata Telephone & Telegraph Co.** Ephrata, Pennsylvania	38,717	21,491,493
38.	**Telephone Electronics, Corp./FAIL Inc.** Jackson, Mississippi	37,154	25,159,003
39.	**Pioneer Telephone Coop., Inc.** Kingfisher, Oklahoma	36,051	25,240,432
40.	**Farmers Telephone Coop., Inc.** Kingstree, South Carolina	35,126	21,263,327
41.	**Rock Hill Telephone Co.** Rock Hill, South Carolina	33,330	20,588,879
42.	**Hargray Telephone Co., Inc.** Hilton Head Island, South Carolina	30,033	21,243,087
43.	**Guam Telephone Authority** Tamuning, Guam	29,184	17,277,108
44.	**Sugar Land Telephone Co.** Sugar Land, Texas	28,807	23,523,572
45.	**Matanuska Telephone Assn., Inc.** Palmer, Alaska	26,361	30,664,000
46.	**Clifton Forge-Waynesboro Telephone Co.** Staunton, Virginia	26,083	17,104,057
47.	**Mankato Citizens Telephone Co.** Mankato, Minnesota	26,012	16,357,818
48.	**Chillicothe Telephone Co.** Chillicothe, Ohio	25,934	17,685,698
49.	**Great Plains Communications, Inc.** Blair, Nebraska	24,746	15,790,860
50.	**Fairbanks Municipal Utilities System** Fairbanks, Alaska	24,050	23,500,000

In Order of Access Lines As of December 31, 1988		Access Lines	Operating Revenues
51.	Lexington Telephone Co. Lexington, North Carolina	23,734	14,991,919
52.	Gulf Telephone Co. Foley, Alabama	23,457	15,598,712
53.	Twin Lakes Telephone Coop. Gainsboro, Tennessee	23,322	9,223,535
54.	Ben Lomand Rural Telephone Coop., Inc. McMinnville, Tennessee	22,052	10,803,689
55.	Skyline Telephone Membership Corp. West Jefferson, North Carolina	21,460	8,712,519
56.	East Ascension Telephone Co., Inc. Gonzales, Louisiana	20,885	13,291,173
57.	Northern States Power Co. • Minot, North Dakota	20,865	9,778,535
58.	Smithville Telephone Co., Inc. Ellettsville, Indiana	20,821	9,620,007
59.	Wood County Telephone Co. Wisconsin Rapids, Wisconsin	20,504	8,932,296
60.	Taconic Telephone Corp. Chatham, New York	20,137	10,638,187
61.	St. Joseph Telephone & Telegraph Co. Port St. Joe, Florida	20,116	17,449,000
62.	Eastex Telephone Coop., Inc. Henderson, Texas	20,101	14,332,832
63.	Coastal Utilities, Inc. Hinesville, Georgia	19,662	13,615,325
64.	South Central Rural Telephone Coop. Corp., Inc. Glasgow, Kentucky	19,047	10,573,076
65.	San Marcos Telephone Co. San Marcos, Texas	18,995	16,389,000
66.	Atlantic Telephone Membership Corp. Shallotte, North Carolina	18,605	7,532,890
67.	Yadkin Valley Telephone Membership Corp. Yadkinville, North Carolina	18,152	9,313,126
68.	Grand River Mutual Telephone Corp. Princeton, Missouri	17,854	10,413,816
69.	Millington Telephone Co., Inc. Millington, Tennessee	17,572	8,159,749
70.	Bradenburg Telephone Co., Inc. Bradenburg, Kentucky	17,324	8,794,928
71.	Ogden Telephone Co. * Spencerport, New York	17,009	6,714,000
72.	Fort Bend Telephone Co., Inc. Rosenberg, Texas	16,912	14,449,006
73.	Warwick Valley Telephone Co. * Warwick, New York	16,902	9,071,149
74.	Mid-Plains Telephone, Inc. * Middleton, Wisconsin	16,820	8,476,885
75.	Urban Telephone Corp. Clintonville, Wisconsin	16,123	7,142,782
76.	Highland Telephone Coop., Inc. Sunbright, Tennessee	16,043	8,319,295
77.	Ace Telephone Assn. Houston, Minnesota	15,946	7,770,367
78.	Lancaster Telephone Co. Lancaster, South Carolina	15,820	8,850,840
79.	Shenandoah Telephone Co. * Edinburg, Virginia	15,727	9,226,517
80.	Missouri Telephone Co. Bolivar, Missouri	15,212	7,171,203
81.	Guadalupe Valley Telephone Coop., Inc. New Braunfels, Texas	15,209	11,227,732
82.	Woodbury Telephone Co. * Woodbury, Connecticut	14,934	9,520,818
83.	Buffalo Valley Telephone * Lewisburg, Pennsylvania	14,559	8,396,723
84.	Farmers Telephone Coop., Inc. Rainsville, Alabama	14,207	7,240,993
85.	Rhinelander Telephone Co. * Rhinelander, Wisconsin	13,941	6,209,500
86.	Harrisonville Telephone Co. Waterloo, Illinois	13,891	8,281,300
87.	Ellensburg Telephone Co., Inc. * Ellensburg, Washington	13,856	8,408,803
88.	Craw-Kan Telephone Coop., Inc. Girard, Kansas	13,297	7,162,534
89.	West Kentucky Rural Telephone Coop. Mayfield, Kentucky	13,267	6,021,987
90.	North Central Telephone Coop., Inc. Lafayette, Tennessee	13,241	6,071,297
91.	Arvig Telecom Pequot Lakes, Minnesota	13,140	8,590,335
92.	Citizens Telephone Co. Brevard, North Carolina	13,028	7,004,802
93.	East Otter Tail Telephone Co. Perham, Minnesota	12,821	7,394,529
94.	Garden Valley Telephone Co. Erskine, Minnesota	12,734	6,724,341
95.	Statesboro Telephone Co., Inc. Statesboro, Georgia	12,589	9,247,977
96.	DeKalb Telephone Coop., Inc. Alexandria, Tennessee	12,477	6,578,830
97.	Home Telephone Co., Inc. Moncks Corner, South Carolina	12,428	8,176,871
98.	UTELCO, Inc. Monroe, Wisconsin	12,353	6,297,000
99.	Chester Telephone Co. Chester, South Carolina	12,017	5,960,470
100.	Star Telephone Membership Corp. Clinton, North Carolina	11,888	5,334,123
101.	Southland Telephone Co. Atmore, Alabama	11,764	7,535,744
102.	Sierra Telephone Co., Inc. Oakhurst, California	11,642	16,546,610
103.	Souris River Telephone Mutual Aid Coop. Minot, North Dakota	11,255	7,000,574

In Order of Access Lines As of December 31, 1988	Access Lines	Operating Revenues
104. **Pioneer Telephone Assn., Inc.** Ulysses, Kansas	11,148	8,769,517
105. **LaFourche Telephone Co., Inc.** LaRose, Louisiana	10,915	14,009,683
106. **Golden West Telecommunications Coop., Inc.** Wall, South Dakota	10,748	7,879,141
107. **New Ulm Telecommunications, Inc.** New Ulm, Minnesota	10,345	5,180,000
108. **Foothills Rural Telephone Coop. Corp., Inc.** Staffordsville, Kentucky	10,258	4,592,992
109. **Brookings Municipal Telephone Co.** Brookings, South Dakota	10,039	4,448,965
110. **Monroeville Telephone Co.** Monroeville, Alabama	10,036	7,029,803
111. **Mountain Rural Telephone Coop. Corp., Inc.** West Liberty, Kentucky	9,894	5,230,593
112. **Pioneer Telephone Coop.** Philomath, Oregon	9,865	5,047,446
113. **Camden Telephone Co.** St. Marys, Georgia	9,862	6,853,269
114. **Fidelity Telephone Co.** Sullivan, Missouri	9,713	7,000,000
115. **Sandhill Telephone Coop., Inc.** Jefferson, South Carolina	9,601	4,874,565
116. **Fort Mill Telephone Co.** Fort Mill, South Carolina	9,317	5,012,557
117. **The North-Eastern Pennsylvania Telephone Co.** Forest City, Pennsylvania	9,291	5,116,639
118. **ENMR Telephone Coop.** Clovis, New Mexico	9,267	15,396,052
119. **Lakedale Telephone Co.** Annandale, Minnesota	9,266	4,846,073
120. **Chautauqua & Erie Telephone Corp.** Westfield, New York	9,231	5,041,293
121. **Surry Telephone Membership Corp.** Dobson, North Carolina	9,226	3,831,775
122. **Interstate Telephone Co., Inc.** West Point, Georgia	9,202	5,161,109
123. **Etex Telephone Coop., Inc.** Gilmer, Texas	9,028	4,959,771
124. **Brindlee Mountain Telephone Co.** Arab, Alabama	8,941	5,510,783
125. **Champaign Telephone Co.** Urbana, Ohio	8,795	3,996,627
126. **West River Mutual Aid Telephone Corp.** Hazen, North Dakota	8,696	4,366,806
127. **Piedmont Rural Telephone Coop., Inc.** Laurens, South Carolina	8,689	4,637,166
128. **Wilkes Telephone & Electric Co.** Washington, Georgia	8,650	3,787,468
129. **Polar Communications Mutual Aid Corp.** Park River, North Dakota	8,569	3,940,528
130. **Pineland Telephone Coop., Inc.** Metter, Georgia	8,536	4,347,307
131. **Palmetto Rural Telephone Coop., Inc.** Walterboro, South Carolina	8,517	4,630,551
132. **Churchill County Telephone** Fallon, Nevada	8,330	5,832,324
133. **Community Service Telephone Co.** Winthrop, Maine	8,289	4,330,927
134. **Palmerton Telephone Co.** Palmerton, Pennsylvania	8,285	4,668,260
135. **Dunkirk & Fredonia Telephone Co.** Fredonia, New York	8,275	3,753,378
136. **Northwestern Indiana Telephone Co.** Hebron, Indiana	8,108	3,904,773
137. **Duo County Telephone Coop., Inc.** Jamestown, Kentucky	8,064	4,073,910
138. **West Carolina Rural Telephone Coop., Inc.** Abbeville, South Carolina	8,023	3,568,084
139. **Clay County Rural Telephone Coop.** Cloverdale, Indiana	7,994	4,140,213
140. **Scott-Rice Telephone Co.** Prior Lake, Minnesota	7,956	4,248,845
141. **Interstate Telecommunications Coop., Inc.** Clear Lake, South Dakota	7,837	4,140,874
142. **Public Service Telephone Co.** Reynolds, Georgia	7,747	6,481,195
143. **Evans Telephone Co.** Turlock, California	7,693	6,997,000
144. **Triangle Telephone Coop., Assn., Inc.** Havre, Montana	7,684	6,162,848
145. **Ringgold Telephone Co.** Ringgold, Georgia	7,667	4,467,537
146. **Melrose Telephone Co.** Melrose, Minnesota	7,600	4,279,489
147. **Pond Branch Telephone Co., Inc.** Gilbert, South Carolina	7,520	4,158,222
148. **Three Rivers Telephone Coop., Inc.** Fairfield, Montana	7,378	5,365,170
149. **Volcano Telephone Co.** Pine Grove, California	7,346	6,941,251
150. **Telephone Service Co.** Wapakoneta, Ohio	7,297	3,889,530

- • Company or parent listed on New York Stock Exchange
- † Company or parent listed on American Stock Exchange
- * Over-the-counter Market
- ‡ Company or parent listed on NASDAQ

Source: United States Telephone Association

Table 25

Selected Financial Information of the Top Four Independent Telephone Companies
As of December 31, 1987

	GTE	United	Contel	Centel	*Other Independants	Total
Revenue: $ millions	15,421	2,982	2,905	1,476	9,764	32,548
Expenses and Income Taxes: $ millions	14,302	3,034	2,862	1,319	9,221	30,738
Net Income: $ millions	1,119	(52)	43	157	543	1,810
Earnings per Share: $	3.29	(0.55)	0.55	3.59	N/A	N/A
Dividends per Share: $	2.48	1.92	1.97	1.68	N/A	N/A
Average Shares Outsanding: millions	329	100	78	120	N/A	N/A
Total Assets: $ millions	28,745	6,558	5,513	3,014	N/A	N/A
Long Term Debt: $ millions	9,587	3,048	1,848	883	N/A	N/A
Customer Access Lines: thousands	13.6	3.5	2.4	1.4	9.0	29.9
Number of Employees: thousands	161.0	23.3	21.7	12.6	76.4	295.0

* Estimated by the NATA Market Research Department

Source: Individual Annual and 10K Company Reports

INTEREXCHANGE MARKET

INTEREXCHANGE MARKET

The market for long distance (interLATA) services has been radically changed by competition. Until 1969, AT&T was the only long distance carrier. In that year, the FCC authorized MCI to provide specialized long distance service. Since then, over 500 companies have sprung up to provide private and/or common-carrier interexchange voice and/or data services. Most of these companies resell capacity of larger carriers and serve small niche markets. Although international long distance is large and growing, this study concentrates on domestic interLATA service.

The interexchange market has spurred significant development in transmission media such as satellite, microwave, and fiber optics. The thrust of these technologies has been to increase the capacity and cost efficiencies of the networks, allowing competing carriers to become more competitive in the marketplace. Consumers have benefited greatly by these initiatives as average long distance rates have plummeted.

The total value of the long distance market has increased from $32.5 billion in 1985 to $51.7 billion in 1988 (see Table 26). Three carriers--AT&T, MCI, and U.S. Sprint--have about 95 percent of the market (see Fig.13). The total number of long distance (intraLATA and interLATA) calls made amounted to some 57 billion. AT&T Communications, by far the largest long distance (interLATA) carrier, had long distance revenues of $38.8 billion in 1988, up from $35.2 billion in 1987. However, AT&T's share of the total market has decreased from 84.6 percent in 1985 to 75.1 percent in 1988. MCI, the second largest long distance carrier, had revenues of $4.6 billion in 1988, up from $3.9 billion in 1987. MCI's share of the market has edged up from 8.6 percent in 1987 to 8.9 percent in 1988. U.S. Sprint's long distance revenue increased from $2.8 billion in 1987 (6.2 percent of the total) to $3.6 billion in 1988 (7.0 percent of the total). Other carriers such as Telecom*USA, Cable and Wireless, and Allnet are beginning to gain on the leaders as they offer advanced voice and data services especially in niche markets.

According to a study sponsored by CompTel, long distance carriers showed an aggregate $1 billion loss in 1987, but reversed that loss in 1988 to achieve a $2 billion profit. Lower tier carriers (those with less than $1 billion in revenue) experienced 45 percent revenue growth, compared to 12 percent for the big three--AT&T, MCI, and U.S. Sprint. Increased revenues from business customers contributed heavily to overall revenue growth. Revenue per business customer increased 5.5 percent.

The CompTel study also detailed carrier costs. Out of $51.7 billion in revenue in 1988, 37 percent was spent on access charges, 29 percent on facilities, 10 percent on general and administrative expenses, 9 percent on operations and maintenance, 8 percent on sales and advertising, 6 percent on depreciation and amortization, and the balance on other miscellaneous expenses (includes profit).

A significant consolidation is underway in the long distance market, as smaller regional companies acquire or merge with other smaller regional companies or form consortiums. For instance Telecom*USA is the result of a recent merger between two regional carriers--SouthernNet and Teleconnect. Advanced Telecommunications of Atlanta has been actively acquiring regional carriers and reportedly has itself been considering an offer to be acquired by Telecom*USA. NTN (National Telecommunications Network) and NSN (National Switch Network) are two consortiums (with some shared members) that have been created to enhance the existing capabilities of their members. NTN was established to offer nationwide private line capacity and facilities resale capabilities and NSN was created to share switch and fiber facilities.

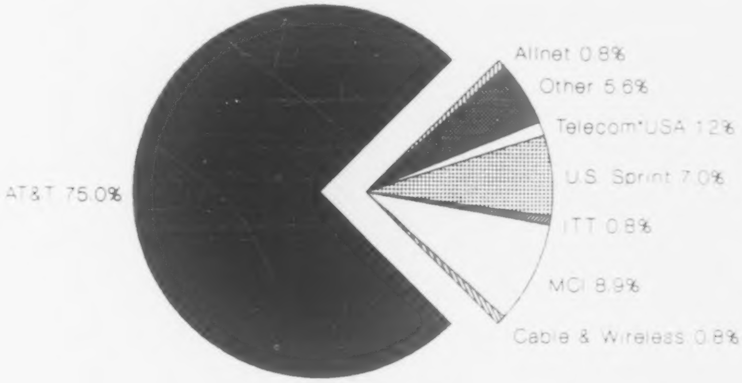
Between 1984 and 1988, nearly 80,000 route miles of fiber optics were laid by long distance carriers. This growth will abate somewhat in the near future as most facilities-based carriers complete their fiber networks. AT&T will continue to deploy fiber for the next two years as it completes its $6 billion network upgrade begun in 1987. By 1990, AT&T's network will be virtually 100 percent digital, with 24,000 miles of fiber optic cables and 53,000 miles of digital network coverage.

These fiber networks have been constructed not only to increase the speed and efficiency of the network, but also to expand the capacity of the network to offer advanced services. In fact, while basic long distance service continues to dominate the market accounting for almost half of the long distance market (see Fig. 14) much of the current 14 average annual growth in the market is in advanced services such as 800, 900, and data transmission.

In fact, the market for 900 services (long distance pay per call), currently offered by AT&T, MCI, U.S. Sprint, and Telesphere, is expected to grow from $500 million in 1988 to $4-5 billion by 1995. Growth in 900 services will come mainly at the expense of growth in 800 services (toll-free long distance), which should remain relatively stable through the next several years. As remote data processing becomes ubiquitous, as with point of sale terminals, automatic teller machines, credit card validation terminals, etc., data transmission services will likely grow from $800 million in 1988 to $5-$6 billion by 1995.

FIGURE 13

1988 Long Distance Market, By Carrier

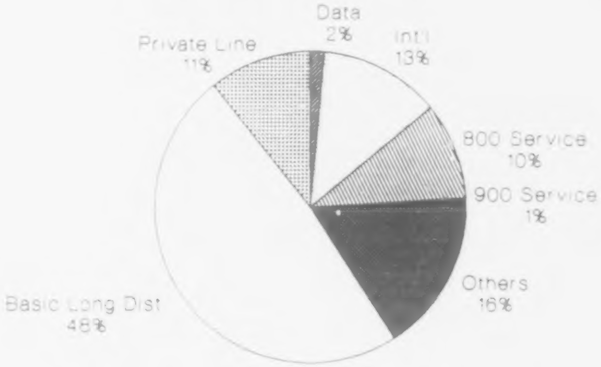


1988 Market=$51.7 Billion

Source: NATA Market Research Dept.

FIGURE 14

1988 Long Distance Market, by Type of Service



1988 Total Market = $51.7 Billion

Source: Estimated by the NATA Market Research Dept. based on various sources

Table 26

Interexchange Revenues* and Market Shares of Major Service Providers, 1985-1988

	1985	1986	1987	1988
	billions of dollars			
AT&T	27.5	32.3	35.2	38.8
MCI	2.5	3.6	3.9	4.6
U.S. Sprint	1.2	2.6	2.8	3.6
Others	1.3	2.9	3.3	4.7
Total	32.5	41.4	45.2	51.7
	percent by total			
AT&T	84.6	78.1	77.9	75.1
MCI	7.6	8.7	8.6	8.9
U.S. Sprint	3.6	6.2	6.2	7.0
Others	4.1	7.0	7.3	9.0
Total	100.0	100.0	100.0	100.0

* Excludes Local Exchange Carriers

Source: Estimated by the NATA Market Research Department, based on industry sources

NETWORK EQUIPMENT MARKET

NETWORK EQUIPMENT MARKET

The network equipment market consists principally of telecommunications equipment used by common carriers to provide telecommunications services (for more information on common carriers see the section on telecommunications services market). The public telecommunications network consists of some 23,000 telephone central office installations, more than 3 billion circuit miles of transmission capacity. Typically, switching equipment represents approximately 50 percent of total telephone industry investment. Overall, the national common carrier network constitutes a capital investment approaching $250 billion.

In terms of value, the principal equipment categories include central office switches, fiber optic cables and associated electronics, and outside plant. Other important equipment categories include various types of transmission equipment, data communications equipment (see section on data communications equipment), and mobile communications equipment (see section on mobile communications).

The network equipment market grew rapidly from $5.0 billion in 1984 to $9.0 billion in 1988 as long distance carriers rapidly their networks to fiber optics (see Table 27). In addition, local carriers have been completing the changeout of their electromechanical switches to electronic switches. In fact, many of the local exchange companies have begun the conversion of their switches to digital in anticipation of ISDN and various advanced services requiring digital switching capability. The number of digital switches installed increased from about 900 in 1985 to an estimated 2500 in 1988. In addition, despite the fact that new switches being sold now are predominantly digital, the market for expansions and upgrades of existing analog switches remains relatively strong.

The largest segment of the network equipment market is represented by the market for CO switches, which grew from $2.9 billion in 1984 to $5.5 billion in 1986 before slowing to an estimated $5.0 billion in 1989. The two largest suppliers of CO switches in the marketplace are AT&T and Northern Telecom (see Fig. 16). Northern Telecom is a Canadian-based subsidiary of Bell Canada, the dominant local exchange company in Canada. Northern Telecom has had many years of experience producing switches for the Canadian network, which is technically virtually identical to the U.S. network.

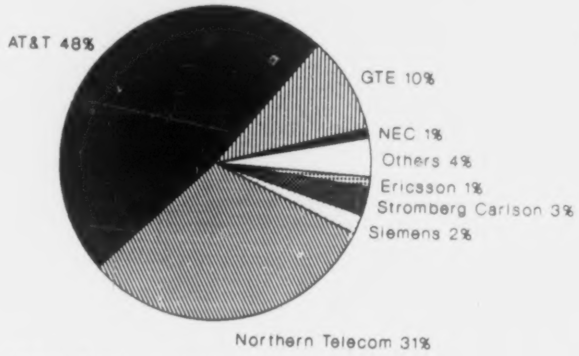
Northern Telecom has been rapidly increasing its share of the CO switch market at the expense of AT&T. Sales of Northern Telecom's switches increased by a compound annual growth rate of 20.3 percent during 1984-89, while AT&T sales increased only 2.3 percent per year. Reasons for this vary, but in general, since divestiture many of the RBOCs have been asserting their independence from AT&T by turning to Northern Telecom. In addition, there have been some complaints that AT&T has been purposefully keeping the centrex feature capability of its CO switches at a minimum level to minimize the competition with its PBXs.

AT&T has not been idle while its RBOC market share was slipping. In mid 1988, AT&T and GTE signed an agreement whereby AT&T would gradually take over the GTE's CO switch business. Considering that GTE is the largest single independent local exchange company in the United States and that GTE's share of the total CO business in 1988 was 10 percent, it represents an aggressive move on AT&T's part to maintain and even increase its total share of the CO switch marketplace.

Other companies which have had minimal success at selling switches have been Stromberg Carlson, Siemens, Ericsson, and NEC. These companies have been trying for several years to crack the RBOC market, but for the most part have been locked out of the large switch orders. What keeps these companies from leaving the marketplace is the anticipation of possible orders in the next big wave of switch changeout, which is likely to begin accelerating during 1992-1995 as the RBOCs are expected to replace about 60 million analog exchange access lines (about 55 percent of the total) with digital lines. While this will provide tremendous opportunities for switch manufacturers, the profitability of the sales are likely to decrease. Prices for CO switches have been on a downward trend for the past couple of years and are not likely to increase significantly in the near future as competition for RBOC business intensifies.

FIGURE 15

1988 CO Switch Market, By Manufacturer

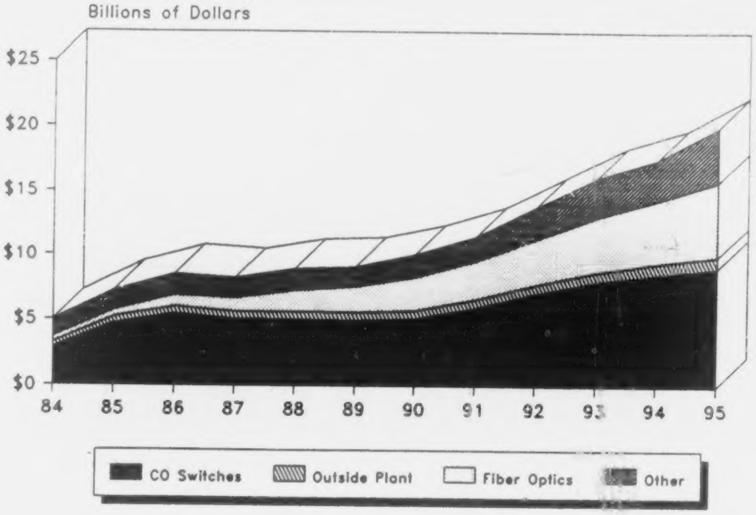


1988 Total Market = $ 9.0 Billion

Source: NATA Market Research Dept.

FIGURE 16

Network Equipment Market, 1984–1995



Source: NATA Market Research Department

Table 27

Network Equipment Market*, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	CAGR* (Percent)
	-millions of dollars-						
Central Office Switches	2,900	4,750	5,500	5,100	5,050	4,975	11.4
Fiber Optics	410	500	883	1,011	1,650	1,990	37.1
Outside Plant	350	475	500	550	575	610	11.8
Other	1,320	1,510	1,630	1,550	1,680	1,520	2.9
Total	4,980	7,235	8,513	8,211	8,955	9,095	12.8

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(p)	CAGR* (Percent)
	-millions of dollars-						
Central Office Switches	5,125	5,975	7,100	8,050	8,575	9,100	12.2
Fiber Optics	2,540	2,950	3,520	4,300	4,950	5,810	18.0
Outside Plant	635	652	683	715	845	900	10.7
Other	1,792	1,925	2,537	3,022	3,155	4,233	18.8
Total	10,092	11,502	13,840	16,087	17,525	20,043	14.7

* Does not include cellular network equipment
** Compound Annual Growth Rate
(e) Estimated
(p) Projected

Source: NATA Market Research Department

CUSTOMER PREMISE EQUIPMENT SUMMARY

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CUSTOMER PREMISES EQUIPMENT SUMMARY

OVERVIEW

In the context of this report, the principal types of customer premises equipment (CPE) addressed include PBXs, key/hybrid systems, facsimile terminals, voice/call processing equipment, data communications equipment (all types, whether placed on the customer's premise or not), consumer telecommunications products, and payphones. The markets for these products, which are sometimes also referred to as terminal equipment, represents at least half of the entire telecommunications equipment marketplace. The bulk of this equipment is used by businesses to enhance internal and external communications. Businesses have come to understand the significant role that communications plays in productivity, efficiency, and profitability. Increasingly, communications capabilities are viewed as strategic assets and as such are given strategic goals of increasing revenue and decreasing costs. To achieve those ends, business users are becoming more sophisticated and proactive in the demands they make on their suppliers of equipment and services. To fill their demands, equipment vendors face both challenges and opportunities.

The various CPE marketplaces are somewhat intertwined, but are also quite separate in terms of market trends, technologies, distribution channels, etc. Therefore, while many of the markets for the different types of CPE are addressed separately, there are some facets of the CPE marketplace that affect a variety of products. Included are the implications of ISDN, the role of systems integration in the marketplace, the growth of the used equipment market (typically called the secondary equipment market), and the development of the market for CPE used in conjunction with centrex services.

ISDN

The implementation of ISDN will undoubtedly have a significant impact on the CPE marketplace. As business users begin to understand and appreciate the advantages of ISDN, they will begin to make buying decisions that will stimulate the market for many types of CPE but depress the market for others. The impact on still other CPE products is largely speculative and will only be known as ISDN implementation develops. Overall, the ISDN CPE market is expected to grow to over $5.0 billion by 1995. The products sold in an ISDN environment include terminal adapters, voice/data/video terminals, PBXs, key systems, multiplexers, local area network bridges, and Group 4 facsimile terminals.

Terminal adapters allow ISDN connectivity with non-ISDN user equipment. These products ease the transition to ISDN and protect the installed base from instant obsolescence. Terminal adaptors currently represent the largest selling segment of ISDN CPE. The market for these products, however, will peak early as ISDN terminals become commonplace.

The market for PBXs in an ISDN environment is difficult to predict. So far, the RBOCs have been promoting the basic-rate interface (BRI) for ISDN. BRI, which has more firmly entrenched standards, is typically used to connect terminal equipment directly to the network. RBOCs have incorporated this technology into their ISDN trials. With the BRI, the RBOCs have positioned digital centrex as the seamless gateway to ISDN. This has frustrated PBX vendors who typically rely on the primary-rate interface (PRI) for connecting PBXs with the other PBXs and with the network. Virtually all major PBX manufacturers have recently announced PBX products with PRI capability. As with the current competitive battle between PBXs and centrex, users will be forced to chose between CO-based ISDN centrex services and PBX-based ISDN capability. The battle will be fought aggressively and the RBOCs already have a slight head start. On the other hand, PBX vendors have a formidable ally in AT&T. AT&T and other interexchange carriers are incorporating PRI in long distance ISDN trials. The outcome is a bit too early to predict but an optimistic forecast would put the market for PBXs with PRI capability at $3.0 billion by 1995.

The market for digital ISDN-compatible key systems will likely be stimulated by implementation of ISDN. For the same reasons that CO-based ISDN centrex will have a moderating affect on the demand for PBXs, it will have a stimulating effect on the demand for key systems. As ISDN centrex increases its share of the business market, key systems will become important adjunct equipment giving the user increased functionality and flexibility. The market for adjunct key systems to be used with CO-based centrex ISDN should experience strong growth and amount to about $50 million by 1995.

More than any other segment of the CPE business, the data communications equipment market will likely experience the most change as ISDN is implemented. Specifically, low-end LANs will likely be displaced by CO-based LANs as the data handling capability of CO switches is enhanced through digital architecture. The market for modems will decline as end-to-end digital connectivity obviates their need. The market for separate packet switching equipment will decrease as digital CO switches assume much of the packet switching requirements of the public network. New and growing data communications markets include LAN-ISDN gateways and terminal adapters. In addition, when PRI applications begin proliferate, the market for multiplexers will accelerate.

One market that will likely explode is the market for Group 4 fax terminals. These fax terminals will bring a new level of utility to facsimile transmission. The expanded capabilities include high transmission speed (about 5 seconds per page) and resolution high enough to use received faxs as originals.

SYSTEMS INTEGRATION

Systems integration can be defined as the combining of hardware, software, and communications into a total package. Systems integration is the sale of applications-oriented solutions to meet a customer's specific telecommunications/data communications needs. Some of the products systems integrators typically offer as part of their solutions include PBXs, key systems, voice mail, fax terminals, LANs, automatic call distributors (ACDs), automated attendants, paging systems, call accounting systems, call/voice processing equipment, facilities management software, centrex, long distance, and other private and public network services.

Systems integration, which developed from the computer environment, is relatively new to the telecommunications marketplace. However, since deregulation and the AT&T divestiture, the implementation of a business communications system has become much more complicated for the end user. Increasing numbers of users (including government agencies) are turning to systems integrators to tailor fit a communications system to their specific needs and applications. There are currently hundreds of systems integrators offering a wide variety of products and services. The revenue potential for systems integration is staggering. In 1987, revenue to systems integrators amounted to $4 billion. By 1992, revenues around $14 billion can be expected. The market is composed of two distinct types of customers--government and business users. The business segment is expected to grow at almost 40 percent per year for the next several years, while the government sector, currently the larger of the two, will grow by about 15 percent per year.

Systems integration will likely continue to stimulate CPE sales. In 1988, about $1.6 billion in CPE was sold through systems integrators. That amount is likely to reach $5.6 billion by 1992.

SECONDARY EQUIPMENT

One of the most rapidly growing aspects of the CPE market is the demand for used equipment (usually referred to as the secondary equipment market). The bulk of the equipment sold in the secondary market is key systems and PBXs, but, as the secondary market develops, other types of equipment are also being remarketed including voice mail, call accounting, and automatic call distributors. The industry has three standards for the equipment, depending on the level of reconditioning--used, refurbished, and remanufactured. The differences between these classifications can be important not only to the customer, but in terms of warranties as well.

> USED EQUIPMENT--As implied, used equipment refers to products that have been pulled from service. Usually this equipment has not been cleaned or tested. Most warranties on used equipment, if available at all, will not exceed a 30-day period from the date of purchase.
>
> REFURBISHED EQUIPMENT--Refurbished equipment is the next step up the ladder. Industry standards require not only that refurbished equipment be cleaned and tested, but

that faulty components replaced. Refurbished equipment also has an extended warranty period, usually 90 days.

REMANUFACTURED EQUIPMENT--The highest level that equipment can reach on the secondary market is remanufactured. Remanufactured equipment goes through rigorous specification testing and reconditioning. The difference between new and remanufactured equipment is slight. Equipment that has been factory remanufactured has had faulty components replaced with new parts. This is typically not the case with refurbished equipment, where bad components may be replaced with used ones. Remanufactured equipment usually comes with a full one-year warranty.

While this market is clearly becoming a force in the CPE marketplace, there are certain constraints to its continued expansion, at least in the short term. Only a small percentage of users are even aware of the secondary market. Before users will consider buying used equipment, they need to be educated to the advantages of secondary equipment.

In addition, many of the initial remarketers were "fly-by-night" companies that were only after a quick profit and did not stay around for service and repair. Users were not satisfied, and a questionable reputation began to haunt the entire industry. This perception problem is changing, however, as self-policing and official complaint-lodging mechanisms seem to be raising industry standards. As more users learn of these developments and become more aware of avenues of recourse, they will begin to have more faith in the equipment and the vendors. Also, remarketers are beginning to grow and become substantial businesses with strong customer service resources. These capablities help customers feel more comfortable about their purchases.

Finally, one of the main reasons that users remain skeptical about the secondary equipment market is the relative lack of support from the manufacturers. AT&T has traditionally supported the secondary equipment market, which has had some positive effect on users. However, there are dozens of other manufacturers, controlling most of the installed base of equipment, who traditionally have not supported the secondary market, thereby reducing its legitimacy. But, this too is changing. During 1989, both ROLM and Northern Telecom announced their support of the secondary equipment market. Other manufacturers are likely to follow suit as they try to maintain their installed base. This increasing manufacturer support will doubtless have a very positive effect on the users' perception of the industry.

The market for secondary equipment has been estimated at about $400 million in 1988, with expectations that it will rise about 15 percent per year through the next several years. Currently, the bulk of the market (40 percent) is in sales directly from the remarketer to the end user. About 33 percent of the market is remarketers' sales to dealers such as interconnects, while 18 percent is accounted for by sales from the user to the remarketer. The balance of the market is accounted for by intracompany transfers and user-to-user sales.

In terms of value, the market is split pretty evenly between system sales and sales of parts only. More dealers are offering parts than complete systems, but the dollar value of the systems sales compensates for the smaller number of remarketers.

Looking closely at the value of system sales, estimates made in 1988 indicate that secondary PBX sales surpass secondary key system sales. This is true because not only do PBXs cost more, established vendors, which are the most likely to sell systems, usually sell more PBXs than key systems in terms of dollar value. As for PBX manufacturer market shares in the secondary market, AT&T products have about 35 percent, Northern Telecom about 17 percent, Mitel 13 percent, Rolm 10 percent, and NEC 8 percent.

The secondary market is currently doing very well since there exists a window of opportunity. Customers that bought their systems during 1984/85 are beginning to look for replacement systems. There is also a certain amount of confusion in the marketplace regarding technology and price. How will ISDN be incorporated into CPE? Is centrex the "true" gateway to ISDN? What effect will the AT&T "dumping" case have on availability of equipment and on price? Is digital the technology of choice for key systems? These questions lead many users to the secondary market as a relatively inexpensive "stopgap" measure until some of these issues are resolved. It may be that the secondary market will always be a strong force, but it is a bit too early to tell.

CENTREX CPE

Centrex services were introduced by AT&T and the Bell Telephone System around 1961 as the preferred service offering for large institutional and corporate accounts. In order to provide centrex, the local telephone company dedicates lines and a portion of the CO switch to an individual customer. Therefore, the intelligence and switching capability of the system resides at the CO rather than on the customer's premise, as is the case with a PBX-based system (see the section on the PBX/Centrex marketplace for a complete discussion).

Prior to the AT&T divestiture, AT&T deliberately encouraged a decline in centrex penetration due to AT&T's commitment to the PBX marketplace. However, in the post-divestiture climate, the RBOCs have been precluded from manufacturing (although they have been allowed to sell CPE, within certain guidelines), and have moved to aggressively rejuvenate and promote centrex services, especially in urban markets. The RBOCs have made centrex their flagship business telecommunications offering and to make it more competitive with PBXs they have fought for, and won, rate reductions. In addition, the RBOCs have enhanced centrex with advanced features, once only available with a PBX.

In this environment centrex has flourished, and so has the market for CPE used in conjunction with centrex. The most popular types of such equipment are key systems with almost 75 percent of all centrex installations using key stations. Other CPE frequently used with centrex includes answering machines, auto dialers, intercoms, paging systems, ACDs, call accounting, and voice mail.

In terms of value, the total annual sales of all centrex CPE for 1988 amounted to about $165 million, with the biggest sellers being voice messaging equipment at about $110 million and ACDs at about $32 million. In terms of units, big sellers in 1988 included key systems at about 2,500 systems, call accounting and voice messaging equipment, both at about 2,000 units, and answering machines at about 1,700 units. The markets for these products are likely to increase as centrex penetration increases.

A development that might keep the market in check, at least for some of these products such as ACDs and voice mail, is that the RBOCs are beginning to incorporate ACD and voice mail features into their centrex offerings. This will cause some displacement of CPE, but so far the sophistication of these centrex features is not equal to the CPE versions, and the cost is relatively high. In the near term, at least, the CPE versions should do quite well.

SELECTED CPE MARKETS

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SELECTED CPE MARKETS

PBX-CENTREX MARKET

INTRODUCTION--Private branch exchanges (PBXs) are multi-line business telephone systems giving users pooled access to a group of external telephone access lines provided by the local telephone company's central office. PBX systems provide essentially the same services as a telephone company central office--dial tone signaling and call routing--but on a much smaller scale and typically from equipment located on a customer's premises. A PBX is often referred to as a switch because, like a central office, it automatically establishes and routes (or switches) calls between the various stations on a user's premises or between an on-premise extension and the public switched network. A distinguishing characteristic of PBX systems is the users' pooled access to outside CO lines. When a user dials "9" or another designated code from an extension, the switch automatically seizes an idle outside line from a pool of available CO lines to complete the call.

In general, PBXs are being equipped with more and more features such as integrated call distributors, cost accounting and voice messaging as well as the ability to bridge local area networks and have full data communications capability. Digital PBXs are replacing analog PBXs, which themselves replaced the old electromechanical types not too many years ago. Several manufacturers have recently announced ISDN compatible PBXs. Even though ISDN is several years away from commercial implementation, manufacturers want to sell PBXs today that will be forward compatible.

"Centrex" is the generic name for a subscriber switching service offered by local telephone companies to business customers. Centrex service provides business with PBX-like features and capabilities directly from the central office, rather than through premises-based PBX equipment. That is, centrex service is provided from the same local switching center that provides business and residential customers alike with dial tone, local call-routing, and access to long distance networks. In order to provide centrex, the local telephone company dedicates lines and a portion of the CO switch to an individual customer.

Typically, centrex service consists of two elements: local-exchange access and switching; and intercom service with a package of call-processing features similar to those available from PBX systems. Centrex has generally been treated as a regulated service, and prices are usually set in tariffs approved by state regulators. There are two growing trends however--to allow flexible tariffing of centrex, sometimes including customized service packages to larger customers where the actual price of the centrex service itself, is not revealed; and to deregulate centrex service completely. In any event, centrex prices tend to vary from state to state.

Three types of CO switches, distinguished by the technologies they embody, currently provide centrex service in various parts of the country: electromechanical, stored program-controlled electronic, and digital.

Prior to the Bell System breakup, the use of centrex--confined primarily to the very large business market--was declining, the result of a deliberate effort by AT&T. Since divestiture, however, the RBOCs have moved aggressively to rejuvenate and promote centrex services, especially in urban markets. To increase the service's appeal to businesses, the RBOCs have fought for and won, deep centrex rate reductions--as well as enhanced feature offerings and lowered minimum line-size restrictions--from state regulators.

Centrex services are currently sold through three channels: the telephone companies' own sales force; authorized third party sales agents that get commissions from the telephone companies; and in some cases, companies that want to sell CPE used with centrex services. These companies will market centrex and arrange for centrex installation as a service to their customer, but not receive any commissions for the sale. This has caused these vendors to make up the associated costs in other areas of the business. At the urging of NATA, the FCC has established the authorized sales agency program as an essential safeguard and precondition to relief for the BOCs from certain regulatory restrictions.

From a users point of view, there are advantages and disadvantages to both centrex and PBXs. The debate concerning which is best has been a popular subject in the trade literature, with one source claiming one is superior to the other and the next source claiming the opposite. In terms of cost to the customer, they are roughly equal with PBXs having some advantage in the longer term at least for certain system sizes (see Fig. 17). In terms of functionality and general user satisfaction rating overall, they come in a dead heat, although there are individual differences in ratings by PBX manufacturer and RBOC (see Fis 18 and 19).

MARKET REVIEW--Total annual PBX line sales have grown rather slowly over the past several years, from 3.8 million lines in 1984 to 4.2 million lines in 1989. As the replacement market picks up and ISDN stimulates demand, lines shipped are expected to increase to 5.4

million by 1995 (see Table 28 and Fig. 20). In terms of systems, annual shipments increased from 25 thousand units valued at $2.8 billion in 1984, to 28 thousand valued at $2.9 billion in 1988. System sales are expected to amount to 32 thousand valued at $3.4 billion in 1995. This upturn is expected as the PBXs that were purchased in the buying spree of 1984 and 1985 need replacement in the coming few years. Table 29 identifies the PBX market potential for the top 30 metropolitan areas.

In an attempt to shore up sales, PBX manufacturers have been buying up interconnect companies in recent years. Manufacturer direct sales (including sales through wholly owned subsidiaries) increased from 50.4 percent of the market in 1986 to 53.9 percent in 1988 (see Table 30). Sales by independent interconnects decreased slightly from 24.1 percent to 23.8 percent (see Fig. 21). Wholesale houses lost ground from 9.7 percent to 5.9 percent for the same period, while the RBOCs' share went from 11.6 percent to 12.6 percent. The share of the total by independent telephone companies decreased from 4.2 percent in 1986 to 3.8 percent in 1988.

PBX-CENTREX INSTALLED BASE--The total installed base of PBXs increased from 22 million lines in 1984 to 25 million in 1989 and is expected to increase to 29 million lines by 1995 (see Table 31 and Fig. 22). The segment likely to do the best between 1989 and 1995 will be the 400-1000 line systems. In the last few years centrex growth has been especially strong in the systems above 1000 lines and the smallest systems between 1 and 99 lines. Telephone companies have targeted the largest businesses for centrex conversion and for the most part, have encouraged centrex sales by the authorized third-party sales agents to smaller customers.

For individual RBOCs, the largest installed base of PBX lines and centrex lines is in Bell Atlantic's territory, where over 4 million PBX lines and almost 2 million centrex lines are installed (see Table 32). As a percent of total centrex/PBX installed base, Ameritech has the highest penetration of centrex lines at 34 percent (see Fig. 23). Figure 24 illustrates the degree of success that the RBOCs have had in selling PBXs in their own territory.

In terms of individual end-user business markets, the engineering/legal/management services, manufacturing, and wholesale businesses have the highest number of installed PBX lines, each with slightly less than 4 million in 1988. The government sector has the highest number of centrex lines in place (see Table 33). In addition, as a percent of total centrex/PBX installed base, the government sector has the highest percentage of centrex lines installed (see Figure 24).

MANUFACTURER TRENDS--The PBX marketplace is extremely competitive. Aside from the tremendous competition between centrex and PBXs, there are dozens of companies trying to capture increasing market share for a product whose demand is relatively stable. This inevitably has led to severe price competition. While there is a range of PBX prices based on system size and configuration (see Fig. 25 for a breakdown of PBX costs for two different configurations), overall, PBX prices per line decreased 2 percent on average between 1984 and 1989 (see Table 34 and Fig. 26). This is compared to overall increases in the consumer price index of 22 percent since 1984. On average, the slide in PBX prices is expected to moderate as prices during 1990-95 are expected to decrease by .6 percent per year. This is been highly problematic for PBX vendors who are having trouble maintaining revenue (see Table 35).

In addition, even though some suppliers have been able to increase total revenue, price erosion has made it very difficult for them to attain profitability. In fact, according to an article in the Washington Post on August 11, 1989, only one manufacturer made a profit in the PBX business in 1988--Mitel. According to the Post article, of the largest PBX suppliers, IBM/ROLM lost the most at $300 million, Northern Telecom lost $50 million, AT&T and NEC, each lost $15 million, and Intecom/Wang lost $10 million. This trend is expected to continue as manufacturers spend more and more money on R&D to remain competitive in an ISDN environment while prices remain stable. Already, manufacturers have begun to prepare for an all digital environment and are shipping significant quantities of digital PBXs (see Fig. 29)

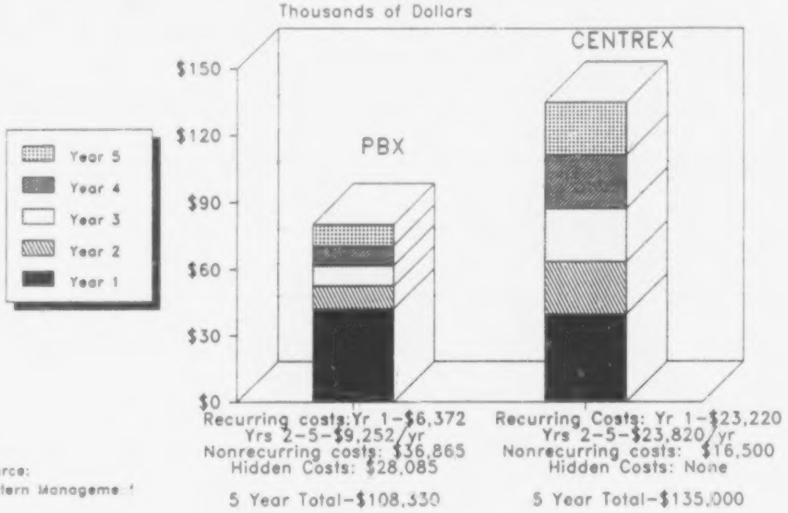
The principal avenue that manufacturers will take to increase their profitability is the continued acquisition of distribution channels to stabilize distribution and to take advantage of more profitable after-market sales. (Some analysts argue that direct distribution brings more problems than solutions and, that, in the long run, direct sales are more costly than sales through independent distributors). Currently most manufacturers split their distribution between various channels (see Fig. 30). This will likely continue, but higher percentages will likely be accounted for by direct sales. In addition, manufacturers are becoming more involved in leasing and financing arrangements in order to be more attractive to customers.

In terms of market share, AT&T, Northern Telecom, and IBM/ROLM had the lion's share of the market in 1988, collectively accounting for 57 percent of the total lines shipped (see Table 36 and Fig.31). Other important players include Mitel, NEC, Siemens, and Fujitsu, accounting for 8 percent, 8 percent, 5 percent, and 4 percent, respectively, of the total lines shipped in 1988.

One development that will undoubtedly affect the market share of PBX manufacturers, especially for the small systems, is the AT&T dumping case. In December 1988, AT&T filed a petition with the International Trade Commission and the U.S. Department of Commerce seeking relief from what AT&T alleged to be sales in the United States of key systems and small PBXs at less than fair market value, i.e., dumped (sold for less than the cost of production, less than the cost in the home market, less than the cost in a third country, or some other measure). The allegations were leveled at producers in Japan, Korea, and Taiwan. Preliminary indications are that the importers will be forced to pay dumping duties, some in excess of 100 percent of the value of the product itself. This will clearly put certain Japanese-, Korean-, and Taiwanese-made equipment at a disadvantage and reduce their presence in the marketplace. Some foreign-owned producers have set up manufacturing in the United States and will be able to avoid the dumping duties as a result. A more detailed description of the proceeding is discussed in the section on foreign trade. In addition, an analysis of the effect on the key system market is discussed in the key/hybrid section of the report.

FIGURE 17

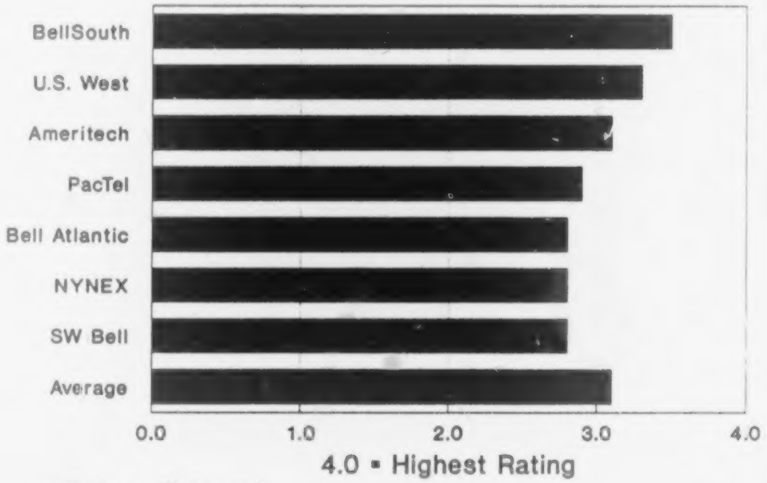
PBX–Centrex Price Comparison Over
A Five-year Period for a 50 Line System



Source:
Eastern Management

FIGURE 18

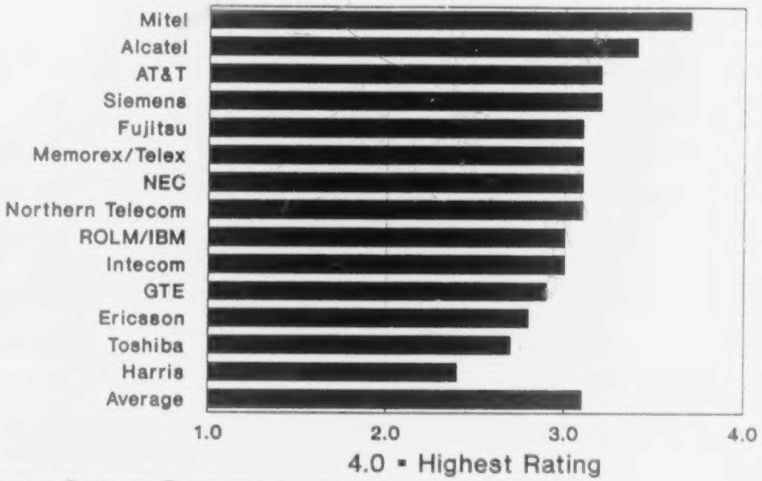
1989 User Satisfaction Ratings
of Centrex Services, by RBOC



Source: Datapro Research

FIGURE 19

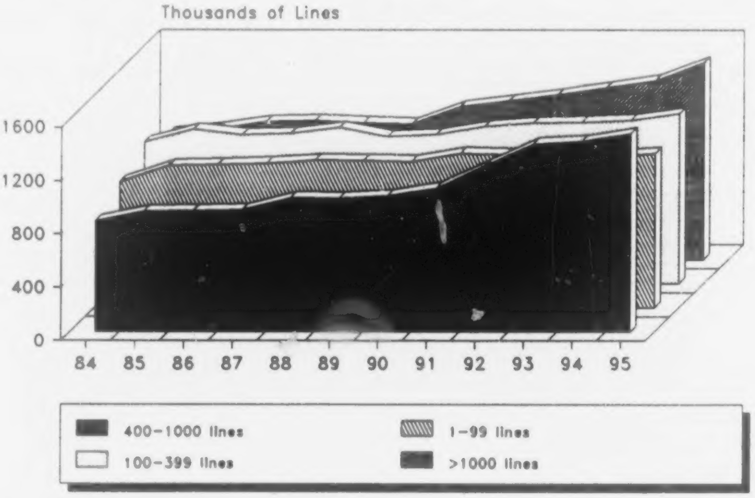
1989 User Satisfaction Ratings of PBXs, by Manufacturer



Source: Datapro Research Corp.

FIGURE 20

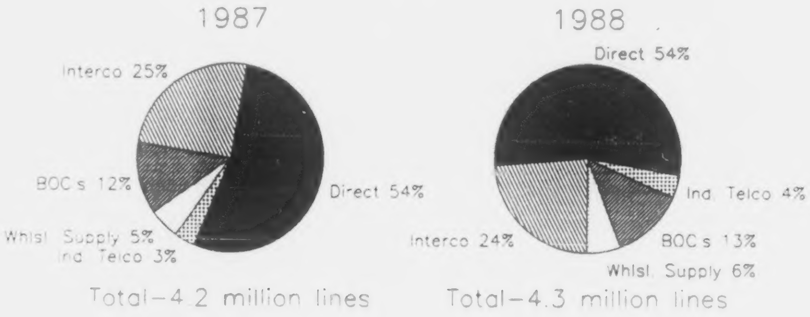
PBX Market, by System Size, 1984–1995



Source: NATA Market Research Department

FIGURE 21

PBX Shipments by Distribution Channel, 1987 and 1988



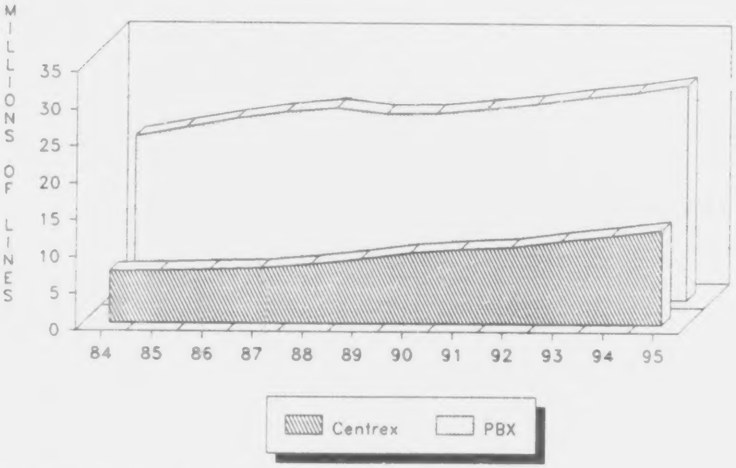
Source: NATA Market Research Department

FIGURE 22

PBX—Centrex Installed Base Development

PBX Compound Growth Rate = 2.6 %

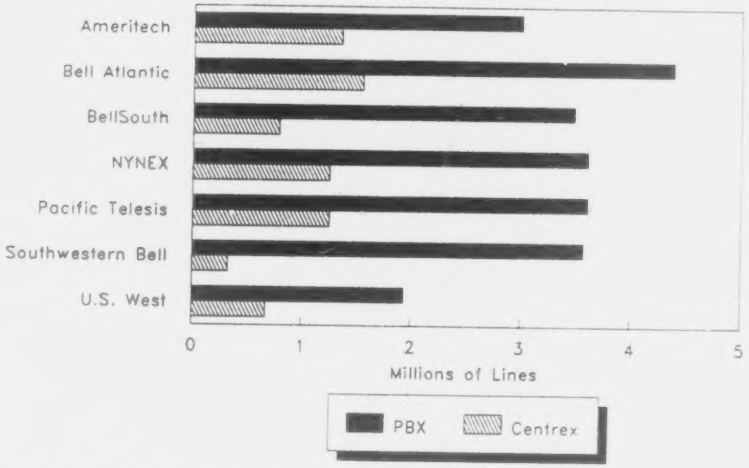
Centrex Compound Growth Rate = 5.7 %



Source: NATA Market Research Department

FIGURE 23

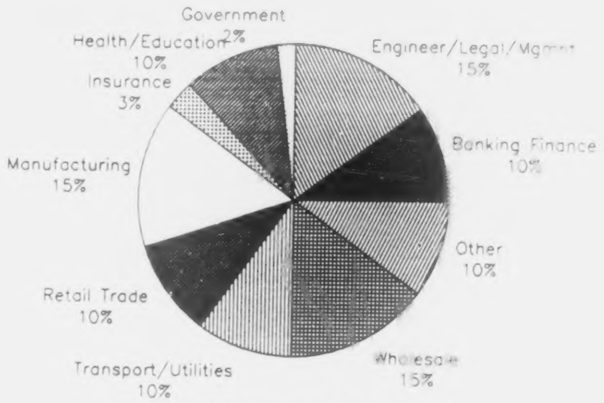
PBX–Centrex Lines Installed, by RBOC Region, 1988



Source: NATA Market Research Department

FIGURE 24

PBX Comparative Market Penetration by End-use Industry, 1988

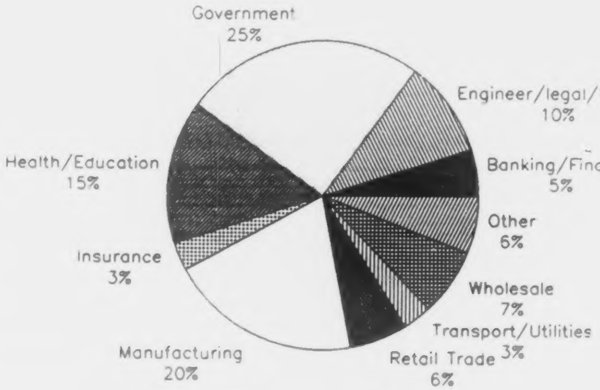


Total 1988 Installed Base = 25.9 Million Lines

Source: Gartner Group

FIGURE 25

Centrex Comparative Market Penetration by End-use Industry, 1988

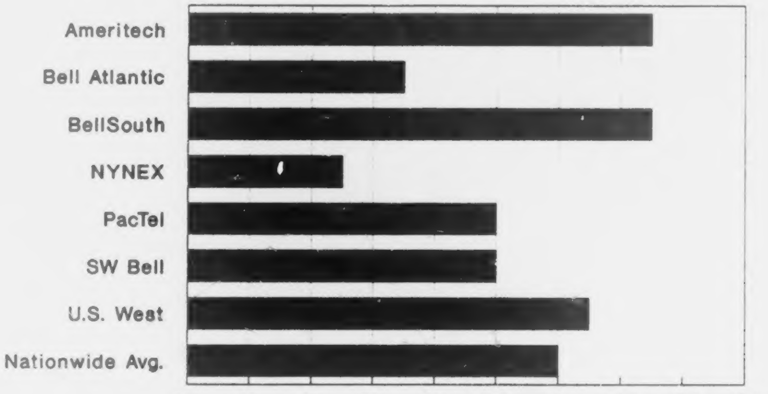


Total 1988 Installed Base = 8.1 Million Lines

Source: Gartner Group

FIGURE 26

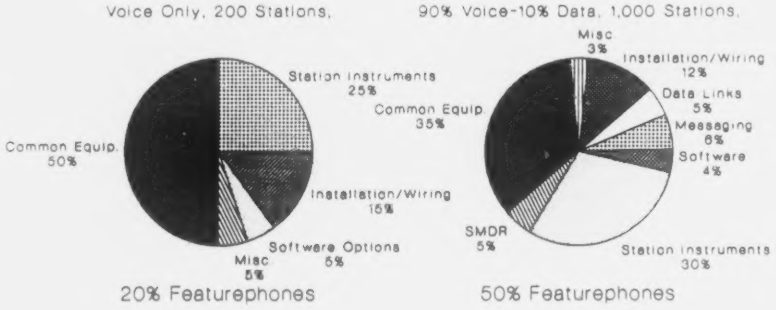
RBOC Share of 1988 PBX Market Within Own Region



Source: Estimated by the NATA
Market Research Department

FIGURE 27

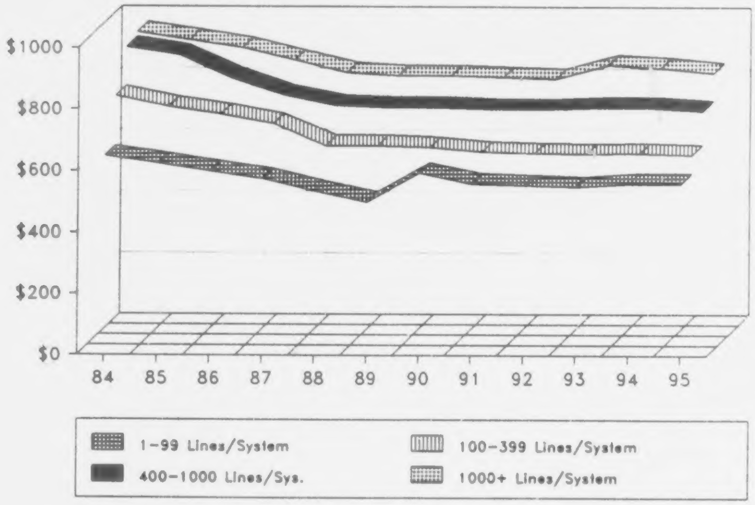
Breakdown of User's PBX Cost For 1988



Source: BCR, June 1989

FIGURE 28

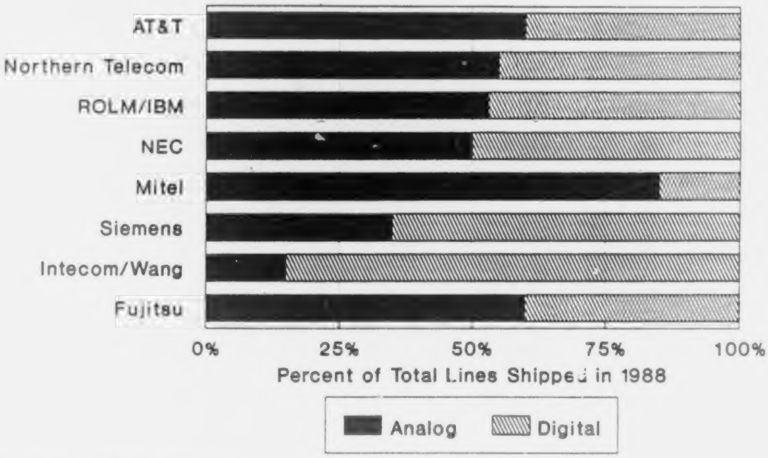
PBX Prices, Per Line, 1984–95



Source: NATA Market Research Department

FIGURE 29

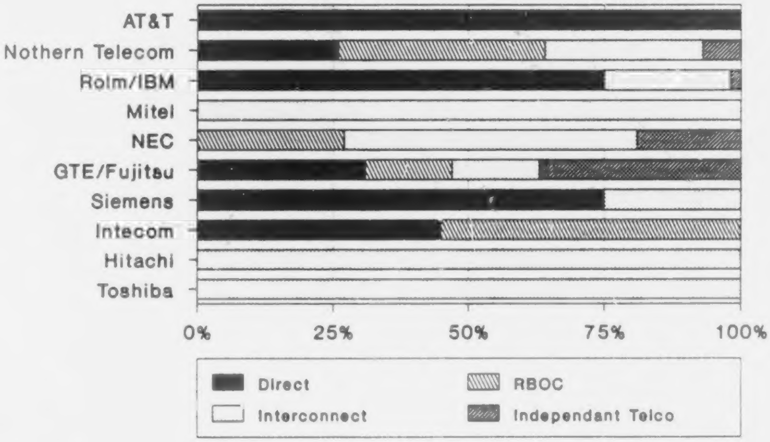
Digital Vs. Analog Share of PBX Line Shipments for 1988



Source: Estimated by the NATA
Market Research Department

FIGURE 30

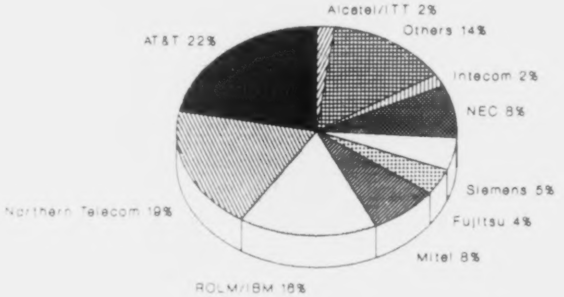
1988 Company-Specific PBX Distribution Channels



Source: Estimated by NATA Research Dept.

FIGURE 31

1988 Manufacturer Market Shares of
PBX Line Shipments



Total Market = 4,319,000 Lines

Source: NATA Research Dept.

Table 28

Annual PBX Sales, by System Size, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	1984-89 *CAGR Percent
1-99 Lines per System:							
Lines: thousands	948	1,069	1,076	1,086	1,110	1,105	3.1
Systems: thousands	16.3	18.4	18.5	18.7	19.1	19.0	3.1
Avg. Lines per System	58.1	58.1	58.2	58.2	58.2	58.3	
100-399 Lines per System:							
Lines: thousands	1,061	1,157	1,118	1,127	1,173	1,104	0.8
Systems: thousands	6.8	7.4	7.1	7.2	7.5	7.1	0.9
Avg. Lines per System	157.0	157.0	157.0	157.0	157.1	157.1	
400-100 Lines per System:							
Lines: thousands	834	907	911	919	1,011	1,006	3.8
Systems: thousands	1.3	1.4	1.4	1.4	1.6	1.6	4.2
Avg. Lines per System	644.5	644.5	644.5	644.5	644.4	644.4	
1000+ Lines per System:							
Lines: thousands	947	982	1,035	1,043	1,025	1,017	1.4
Systems: thousands	0.3	0.3	0.3	0.4	0.3	0.3	**
Avg. Lines per System	2,975.3	2,975.2	2,975.2	2,975.1	2,975.0	2,975.0	
Total:							
Lines: thousands	3,790	4,115	4,140	4,175	4,319	4,232	2.2
Systems: thousands	24.7	27.5	27.3	27.7	28.5	28.0	2.5
Avg. Lines per System	153.4	149.6	151.6	150.7	151.5	151.1	
Value: millions	$2,843	$3,086	$3,105	$3,050	$2,928	$2,875	0.2
Avg. price per line: dollars	$ 750	$ 750	$ 750	$ 731	$ 678	$ 679	-1.1

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(e)	1990-95 * CAGR Percent
1-99 Lines per System:							
Lines: thousands	1,100	1,159	1,150	1,130	1,135	1,160	1.0
Systems: thousands	18.9	19.8	19.7	19.3	19.4	20.3	1.4
Avg. Lines per System	58.3	58.4	58.4	58.5	58.5	57.3	
100-399 Lines per System:							
Lines: thousands	1,120	1,180	1,205	1,210	1,225	1,275	2.6
Systems: thousands	7.1	7.5	7.7	7.7	7.8	8.2	2.9
Avg. Lines per System	157.1	157.1	157.2	157.3	157.3	156.0	
400-100 Lines per System:							
Lines: thousands	1,025	1,082	1,250	1,410	1,430	1,490	7.8
Systems: thousands	1.6	1.7	1.9	2.1	2.2	2.4	8.4
Avg. Lines per System	644.4	644.4	644.5	644.5	644.5	643.0	
1000+ Lines per System:							
Lines: thousands	1,146	1,189	1,235	1,285	1,340	1,475	5.2
Systems: thousands	0.4	0.4	0.4	.4	.4	.5	4.6
Avg. Lines per System	2,990.0	2,992.0	2,995.0	2,995.0	2,995.0	2,985.0	
Total:							
Lines: thousands	4,391	4,610	4,840	5,355	5,130	5,400	4.2
Systems: thousands	28.9	29.4	29.7	29.7	30.2	31.6	1.8
Avg. Lines per System	151.9	156.8	162.9	169.5	170.0	170.9	
Value: millions	$2,850	$2,925	$3,100	$3,250	$3,285	$3,400	3.6
Avg. price per line: dollars	$ 649	$ 634	$ 640	$ 645	$ 640	$ 630	-0.6

(r) Revised
(e) Estimated
* Compound Annual Growth Rate
(p) Projected
** Less than .05 Percent

Source: NATA Market Research Department

Table 29

PBX Installed Base and Annual Sales for the Top 30 Metropolitan Areas, 1985, 1990 and 1995

City	PBX Installed Base In No. of Systems			Annual PBX Shipments In No. of Systems		
	1985	1990	1995	1985	1990	1995
Atlanta	1,702	2,052	2,252	255	308	338
Baltimore	1,416	1,554	1,609	212	233	241
Boston	3,357	4,012	4,346	503	601	651
Chicago	6,698	7,359	7,754	1,004	1,103	1,163
Cincinnati	1,162	1,320	1,384	174	198	208
Cleveland	1,815	1,955	2,004	272	293	300
Columbus	881	1,028	1,099	132	154	164
Dallas/Ft. Worth	3,157	4,189	4,561	473	628	684
Denver	1,655	2,033	2,291	248	304	343
Detroit	3,002	3,333	3,757	450	499	563
Houston	3,118	3,051	3,123	467	455	502
Indianapolis	950	1,088	1,135	142	163	170
Kansas City	1,229	1,381	1,450	184	207	217
Los Angeles	7,469	8,371	8,922	1,120	1,255	1,338
Miami	1,473	1,649	1,748	220	247	262
Milwaukee	1,323	1,447	1,514	198	217	227
Minneapolis/St. Paul	2,311	2,762	3,003	346	414	450
New Orleans	1,027	1,116	1,169	154	167	175
New York	7,395	7,917	8,237	1,109	1,187	1,235
Oklahoma City	739	870	946	110	130	141
Phoenix	1,223	1,660	1,932	183	249	289
Pittsburgh	1,539	1,678	1,736	230	251	260
Portland	1,072	1,294	1,426	160	194	213
Philadelphia	3,552	3,916	4,086	532	587	612
St. Louis	1,989	2,231	2,337	298	334	350
San Diego	1,131	1,416	1,575	169	212	236
San Francisco	2,757	3,137	3,373	413	470	505
San Jose	1,095	1,414	1,583	164	212	237
Seattle	1,351	1,657	1,808	202	248	271
Washington	2,337	2,704	2,895	350	405	434

Source: NATA Market Research Department.

Table 30

PBX Shipments by Manufacturers' Distribution Channel, 1986-1988

	1986		1987		1988	
	Lines (thousands)	Share (percent)	Lines (thousands)	Share (percent)	Lines (thousands)	Share (percent)
Manuf. Direct*	2,087	50.4	2,242	53.7	2,328	53.9
Interconnect	998	24.1	1,044	25.0	1,028	23.8
Wholesale Supply Houses	404	9.7	225	5.4	255	5.9
Bell Operating Co.	479	11.6	518	12.4	544	12.6
Independent Operating Companies	172	4.2	146	3.5	164	3.8
Total	4,140	100.0	4,175	100.0	4,319	100.0

* Includes wholly-owned distributor networks.

Source: NATA Market Research Department

Table 31

PBX-Centrex* Installed Base Development, 1984-1995

	1984	1985	1986	1987	1988	1989	**CAGR
	Thousands of Lines						Percent
1-99 Lines per System:							
PBX	5,484	5,794	5,851	6,077	6,085	5,985	1.8
Centrex	925	935	957	1,129	1,214	1,414	10.9
100-399 Lines per System:							
PBX	6,142	6,489	6,826	7,343	7,510	7,292	3.5
Centrex	827	840	834	902	972	1,062	5.1
400-1000 Lines per System:							
PBX	4,825	5,099	5,607	5,824	5,956	6,035	4.6
Centrex	1,426	1,440	1,544	1,441	1,550	1,495	.9
1000+ Lines per System:							
PBX	5,483	5,794	6,095	6,070	6,346	5,833	1.2
Centrex	3,875	3,925	4,020	4,053	4,364	4,879	4.7
TOTAL:							
PBX	21,934	23,176	24,379	25,320	25,897	25,145	2.8
Centrex	7,053	7,140	7,355	7,525	8,100	8,850	4.6

	1990	1991	1992	1993	1994	1995	**CAGR
	Thousands of Lines						Percent
1-99 Lines per System:							
PBX	5,860	6,081	6,328	6,530	6,680	6,830	3.1
Centrex	1,554	1,750	1,925	2,060	2,200	2,290	8.0
100-399 Lines per System:							
PBX	7,308	7,332	7,412	7,505	7,590	7,700	1.1
Centrex	1,157	1,275	1,365	1,490	1,562	1,635	7.2
400-1000 Lines per System:							
PBX	6,048	6,166	6,323	6,625	6,880	7,300	3.8
Centrex	1,505	1,515	1,545	1,680	1,815	1,960	5.4
1000+ Lines per System:							
PBX	5,984	6,232	6,486	6,748	7,020	7,370	4.3
Centrex	5,514	5,625	5,700	6,160	6,530	7,050	5.0
TOTAL:							
PBX	25,200	25,811	26,549	27,408	28,170	29,200	3.0
Centrex	9,730	10,165	10,535	11,390	12,107	12,935	5.9

* Revised from Previous Reports

** Compound Annual Growth Rate

Source: NATA Market Research Department

Table 32

PBX-Centrex Lines in Place, by Regional Bell Operating Company, 1986-1990

	1986	1987	1988	1989(e)	1990(p)	CAGR*
	Thousands of Lines					Percent
Ameritech						
PBX	2,857	2,986	3,002	3,025	3,175	2.7
Centrex	1,020	1,185	1,350	1,575	1,720	14.0
Bell Atlantic						
PBX	4,085	4,269	4,390	4,375	4,469	2.3
Centrex	1,375	1,480	1,550	1,675	1,810	7.1
BellSouth						
PBX	3,120	3,406	3,485	3,365	3,475	2.7
Centrex	450	675	785	795	810	15.8
NYNEX						
PBX	3,320	3,530	3,610	3,505	3,575	1.9
Centrex	1,210	1,225	1,250	1,410	1,530	4.8
PACTEL						
PBX	3,025	3,067	3,150	3,040	3,173	1.2
Centrex	875	935	950	960	960	2.3
SW Bell						
PBX	3,300	3,420	3,575	3,835	4,076	5.4
Centrex	250	300	325	375	450	15.8
U.S. West						
PBX	1,990	2,045	1,936	1,234	1,485	-7.0
Centrex	477	596	675	732	990	20.0
TOTAL						
PBX	21,697	22,723	23,148	22,379	23,428	1.9
Centrex	5,907	6,396	6,885	7,522	8,270	8.8

(e) Estimated
(p) Projected
* Compound Annual Growth Rate

Table 33

PBX-Centrex Penetration, by Industry, 1988

	Percent of Installed PBX Lines	Percent of Installed Centrex Lines
	Percent	
Banking/Finance	10	5
Engineering/Legal/Management	15	10
Government	2	25
Health/Education	10	15
Insurance	3	3
Manufacturing	15	20
Retail Trade	10	6
Transportation/Utilities	10	3
Wholesale	15	7
Other	10	6
Total	100	100

Source: Gartner Group

Table 34

PBX Per Line Prices, by System Size, 1984-1995

System	1984	1985	1986	1987	1988	1989(e)	CAGR*
	dollars per line						(Percent)
1-99 Lines per System	650	625	600	575	535	500	-1.6
100-399 Lines per System	810	775	750	720	650	650	-4.3
400-1000 Lines per System	935	910	835	780	745	740	-4.6
1000+ Lines per System	950	925	900	860	820	810	-2.8
Average	750	750	750	731	678	679	-6.5

System	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(p)	CAGR*
	dollars per line						(Percent)
1-99 Lines per System	595	560	555	550	560	560	-1.2
100-399 Lines per System	645	630	625	623	625	620	-0.8
400-1000 Lines per System	740	735	735	740	740	730	-0.3
1000+ Lines per System	810	805	800	845	835	820	2.5
Average	649	634	640	645	640	630	-0.6

(e) Estimated
* Compound Annual Growth Rate
(p) Projected

Source: NATA Market Research Department

Table 35

Estimated Revenue for Major PBX Manufacturers, 1986-1988

	1986	1987	1988
	- - - - millions of dollars	- - -	
AT&T	460	450	400
Northern Telecom	385	345	335
IBM/ROLM	265	265	300
NEC	150	145	135
Mitel	110	90	100
Siemens	90	85	95
Intecom/Wang	45	40	35
Fujitsu	25	60	65

Source: Washington Post; August 11, 1989

Table 36

1988 PBX Manufacturer Market Shares, by Lines Shipped, by System Size

(in percent)

	1-99	100-399	400-999	1000+	Total
AT&T	11	27	24	28	22
Northern Telecom	22	13	19	24	19
ROLM/IBM	18	14	17	17	16
Mitel	17	9	4	3	8
NEC	3	10	11	8	8
Siemens	9	4	4	3	5
Fujitsu	2	8	5	1	4
Alcatel/ITT	5	2	1	*	2
Intecom/Wang	*	*	*	10	2
Others	13	13	15	6	14
Total	100	100	100	100	100

* Less than 1 percent

Source: NATA Market Research Department

KEY/HYBRID TELEPHONE SYSTEM MARKET

INTRODUCTION--Key telephone systems are multi-line business communications systems providing users with shared access to a group of external telephone lines through buttons (or keys) located on the telephone set. Typically, each key is associated with a specific outside line, and that line's number appears on the key. When a user presses a key and lifts the telephone receiver off-hook, a circuit is completed and the user receives a dial tone from the telephone company's central office (CO). The buttons on a key telephone generally light up and flash to indicate the status of the line to which the phone is connected. For example, an unlit button indicates an idle line; a slow flash indicates an incoming call; a fast flash indicates a call on hold; and a steady light indicates that the line is in use. This type of network access is referred to as direct line termination, as each incoming line is connected directly to a specific key on the telephone set.

Key systems are primarily voice communications systems for use in small to medium-sized offices--those requiring from 2 to 120 station sets. These systems provide intraoffice communications links (intercom), shared access to the public switched telephone network and long-distance networks, and limited office-automation functions (such as call accounting).

Key systems can serve either as stand-alones or as adjuncts to larger PBX systems or centrex offerings. As a stand-alone, the key/hybrid, acting as the primary telecommunications system within a small business or branch office, is connected directly to the local telephone company central office. As an adjunct, the key system is installed alongside a PBX or centrex system, providing users with access to those switching systems' enhanced features, as well as affording greater ease of use than do standard single-line telephone sets. About 30 percent of the installed base of key/hybrid systems in use are used in conjunction with either a PBX or with centrex.

Key systems have evolved from electromechanical devices to electronic systems using solid state, integrated circuits, and microprocessors. Hybrid key systems are the most recent variety, having been introduced in the late 1970s. The designation "hybrid" refers to the key system's ability to provide direct-line-terminated, one-button-per-line network access typical of traditional key systems, or the "dial 9" pooled access characteristic of PBX systems--with some able to provide both types of network access simultaneously to different station sets.

Typical features of a modern hybrid key system include call restriction, system speed dialing, system administration, night service, emergency power, and station message detail recording. At the other end of the spectrum, key systems without a KSU (key service unit) are becoming increasingly popular, particularly in small businesses, due to their ease of installation and their decentralized configuration.

In addition, as the implementation of ISDN progresses, more and more manufacturers offer end-to-end digital key systems to complement their analog product offerings. In addition, all-digital systems support modemless data communications capability.

MARKET REVIEW--The key system market decreased from just over 4.2 million stations valued at over $1.0 billion in 1984 to just under 4.2 million stations valued at $955 million in 1985 (see Table 37). Since then, the market has increased very slowly, reaching 4.3

million stations in 1989 valued at $990 million (see Fig. 32). It is anticipated that the growth of the market will accelerate somewhat in the next few years and amount to 5.8 million stations valued at $1.3 billion in 1995. The market is currently characterized by a relatively large number of suppliers competing for market share. Profit margins have been slim. Vendors of key systems are beginning to market the products creatively. One aspect of that has been the growth in key systems used in conjunction with centrex, especially with smaller users. Growth of the market for the smallest line-size segment--1 to 24 stations--is expected to increase the fastest between now and 1995 (see Fig. 33).

As with PBXs, manufacturers of key systems are increasingly selling directly to end users. A significant development has been the acquisition by manufacturers of interconnect companies. TIE alone has acquired some 40 interconnect companies in the last several years. As shown in Table 38, manufacturers' direct sales (including wholly owned distribution networks), increased from 1.3 million stations in 1986 (31.1 percent of the market) to 1.5 million stations in 1988 (34.2 percent of the market) (see Fig. 34). Sales by independent interconnects increased from just under 1.9 million stations (44.7 percent of the market) to just over 1.9 million stations (45.2 percent of the market) during the same time period. The two distribution channels which lost market share during 1986-88 were wholesale supply houses and independent operating companies.

INSTALLED BASE--The installed base of key and hybrid key systems in the U.S. increased from 27.6 million stations in 1984 to 29.6 million stations in 1989 and is expected to increase to 30.0 million stations by 1995 (see Table 39 and Fig. 35). In terms of systems, the installed base increased from 5.1 million in 1984 to 5.3 million in 1989 and is expected to amount to 5.1 million in 1995.

As for industry penetration, the single most significant market for key systems is the engineering/legal/management services market, accounting for 16 percent of all key systems sold in 1988 (see Table 40 and Fig. 36). Health/education and retail markets were close seconds, each with 15 percent of the market.

AT&T DUMPING CASE--On December 28, 1988, a petition was filed with the U.S. International Trade Commission (ITC) and the U.S. Department of Commerce (Commerce) by AT&T Co. and Comdial Corp. alleging that the industry in the United States that manufactures small telephone systems (principally key systems) was being injured by imports of those products from Japan, South Korea, and Taiwan that were being sold in the United States at less than fair value, i.e., dumped. In the petition, AT&T and Comdial argued that the scope of the investigation should include all telephone systems having between 2 and 256 nonblocking ports or up to 100 internal lines. For AT&T's products, this includes all key/hybrid systems and AT&T's System 25 PBX.

On February 13, 1989, the ITC concluded its preliminary investigation and decided that there was a reasonable indication that a U.S. industry was being injured by reason of imports from Japan, Korea, and Taiwan being sold in the United States at less than fair value. Moreover, the ITC concluded that the case was a complicated one and that all of the relevant issues could not be explored fully in the 45 days allowed for the preliminary investigation. In essence, the ITC decided that they did not have enough information to conclude anything definitively and that the case should continue in order that the Commissioners make a better informed decision.

Commerce made its preliminary decision of dumping margins on July 26, 1989. On July 10, 1989, Matsushita and Toshiba announced they would no longer participate in Commerce's investigation. As a result, Commerce was required to rely on the best available information, which happened to be from the AT&T/Comdial petition. It calculated margins for major importers from each country, which collectively accounted for at least 60 percent of total imports from that country during the period of investigation. It also calculated margins for those foreign producers that volunteered to cooperate.

The preliminary margins set for Japanese companies were 136.77 percent for Toshiba, 178.93 percent for Matsushita, and 157.85 percent for all other Japanese producers (Toshiba and Matsushita were the only Japanese companies for which margins were calculated, because together they accounted for more than 60 percent of imports from Japan during July-December 1988 and no other Japanese producers stepped forward and volunteered to cooperate.)

With respect to Taiwanese producers, Commerce investigated Taiwan Nitsuko and Sun Moon Star. Taiwan Nitsuko did not cooperate with Commerce's investigation, and Commerce relied on information from the petition and determined a preliminary margin of 129.73 percent. Sun Moon Star cooperated fully with Commerce's investigation. Commerce determined a preliminary margin of 0.00 percent for Sun Moon Star. The preliminary margin for all other Taiwanese producers was determined to be 129.73 percent.

Of Korean companies, Samsung and Goldstar were investigated. They responded fully to Commerce inquiries. Commerce calculated preliminary dumping margins of 9.33 percent for Samsung, 6.09 percent for Goldstar, and 7.79 percent for all other Korean producers.

At the time of its preliminary decision, Commerce instructed the U.S. Customs Service to suspend the liquidation of all entries of small business telephone systems from Japan, Korea, and Taiwan and to require the posting of cash, bonds, or securities equal to the amount of the dumping margins on all subsequent shipments.

During August 1989, one of the Korean companies requested and was granted an extension for responding to Commerce's inquiries. Therefor, while Commerce made its final determination of margins for Taiwan and Japan on October 10, 1989, the determination of final margins for Korea is delayed until December 28, 1989. ITC's decision for Taiwan and Japan is set for the week of November 20, 1989. For Korea, it will be postponed until February 1990.

As mentioned, on October 10, 1989, Commerce made its final determination of margins for Taiwanese and Japanese companies. The margins remained the same as the preliminary margins with the very notable exception that the margins for "all other Taiwanese companies" went from 129.73 percent to 0.00 percent.

At the time of this writing, ITC has not made its final determination for any of the countries. However, the likely outcome is an affirmative decision with dumping duties imposed. The impact of such a decision on the marketplace is likely to be mixed. Overall, the prices for small business telephone systems will likely increase somewhat--perhaps as much as 10 to 15 percent--at least in the near term. For some manufacturers this will be necessary to cover additional expenses associated with adjusting to the outcome of the case, i.e., either the additional costs incurred in shifting production to a location not subject to the dumping duties or the extra costs of the dumping duties themselves. Depending on the specific dumping margin and financial resources, individual companies will react in different ways.

The Korean manufacturers have been found to have relatively low preliminary margins. If these margins hold in Commerce's final investigation, Goldstar, Samsung, and the other Korean manufacturers will probably not shift production, but will probably raise prices, at least somewhat. If the final margins are significantly higher, both Goldstar and Samsung have production facilities in the United States they could expand to produce small business telephone systems.

Toshiba has already announced it will expand its manufacturing facility in Irvine, California, and Matsushita will likely move its production facilities, probably either to Peachtree City, Georgia, San Juan, Puerto Rico, or some other facility not subject to the dumping order. Other Japanese suppliers that are forced to pay the 157.85 percent dumping margins are likely to be significantly adversely affected. With the exception of NEC, which has a facility in Irving, Texas, and Iwatsu, which has a facility in Carlstadt, New Jersey, and another about to open in Charlotte, North Carolina, most other Japanese producers, mainly smaller manufacturers, will likely lose significant market share, since many do not have the resources to shift production and must somehow try to absorb the additional duties. Another possible exception is Nitsuko, which does have adequate facilities in its U.S. headquarters in Shelton, Connecticut, to set up production.

Collectively, these smaller Japanese companies account for some 20 percent of the market. After one year from the imposition of the dumping order, any interested company can request that Commerce review the dumping margins. At that point, these Japanese suppliers can seek to have the margins reduced. Until then, there is not much they can do except perhaps to band together and attempt to set up a joint facility. If these companies are locked out of the market, even for a year, the impact on their distributors will be severe, while it would be a boon to other manufacturers that could exploit the opportunity and increase market share at the expense of the affected companies.

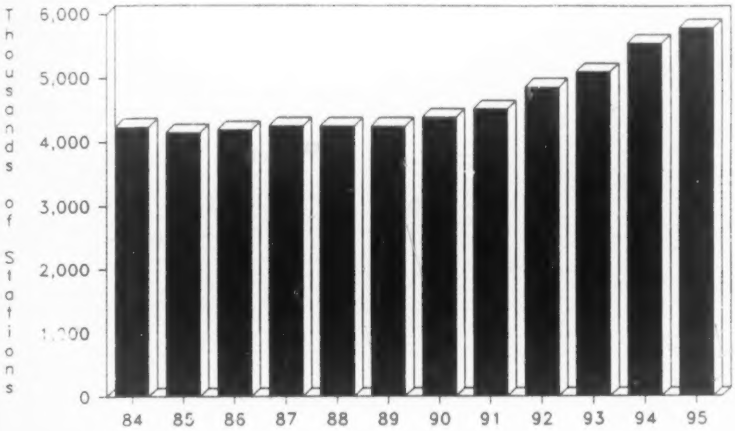
Manufacturers not directly impacted by the outcome; i.e., domestic producers and producers in nonsubject countries such as France and Germany, will likely take advantage of this situation and, at least in the short term increase prices somewhat, while still attempting to increase market share at the expense of the affected firms. The idea of price increases will be welcome news for much of the industry, which has been experiencing razor-thin profit margins. Even the distributor community (except those distributors that handle the severely impacted products) will be able to take advantage of a strengthening of prices.

Within a year or so, however, prices will begin to fall again as the companies adapt to a changed environment. The major long-term effect will be a redistribution of the market among the major players (see Table 41 and Fig. 37 for anticipated shifts in market share). Likely market share winners will be AT&T, Comdial, TIE (which has manufacturing facilities in 12 countries around the world and can adjust quickly to any final decision made), NEC, Alcatel, Sun Moon Star, and Executone, which is shifting production to the Dominican Republic, where it already has established an affiliated manufacturer. Toshiba and Matsushita will probably hold on to their market share. Others will fight for the remainder of the market.

Another implication of an affirmative dumping decision would be an increase in the replacement rate of the installed base. As foreign manufacturers adjust by moving manufacturing, they are moving only newer generation products. The result is that adds, moves, and changes for older version products in the installed base will become significantly more costly. This will induce many customers to replace their systems.

FIGURE 32

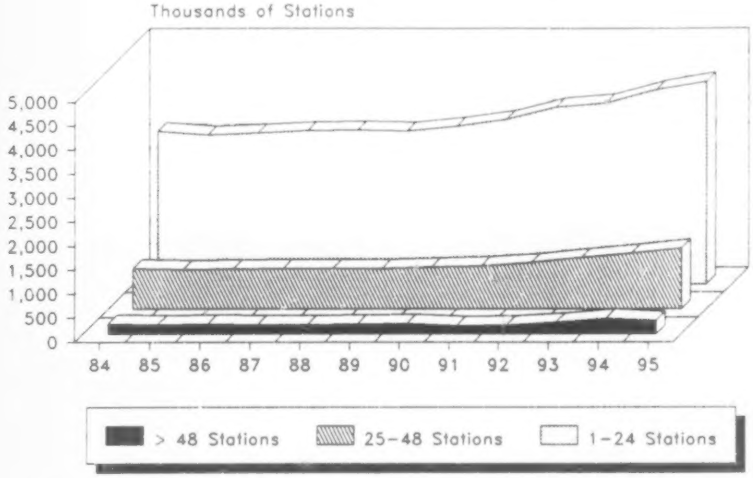
Total Key Station Shipments, 1984–1995



Source: NATA Market Research Department

FIGURE 33

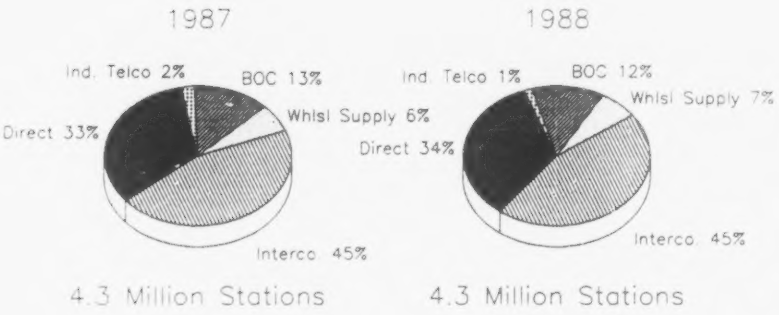
Key/Hybrid Station Shipments, by Type, 1984–1995



Source: NATA Market Research Department

FIGURE 34

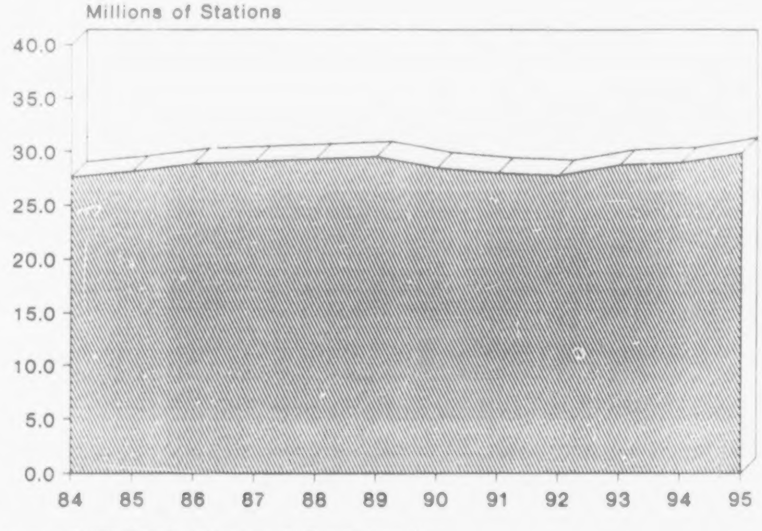
Key/Hybrid Shipments, by Distribution Channel, 1987 and 1988



Source: NATA Market Research Department

FIGURE 35

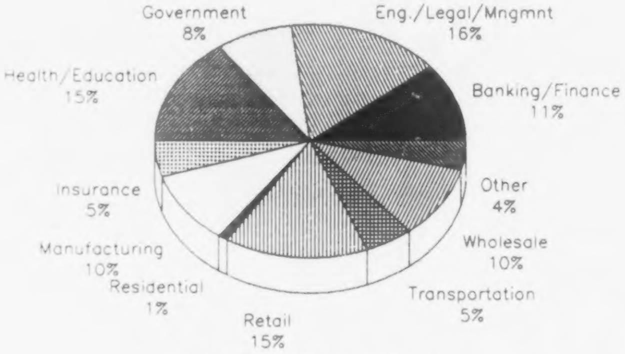
Key/Hybrid Installed Base, 1984-95



Source: NATA Market Research Department

FIGURE 36

1988 Key System Market, By End-use Industry

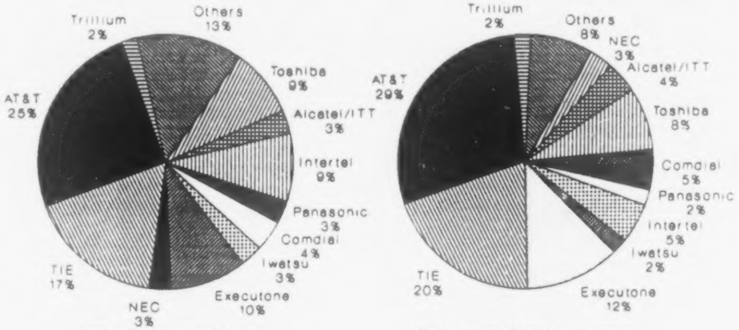


1988 Total Market–
4,260,000 Stations

Source: Gartner Group

FIGURE 37

Key/Hybrid Manufacturers' Market Share of Stations Shipped, 1988 and 1990



1988 Total Market •
4,260,000 Stations

Est. 1990 Total Market •
4,395,000 Stations

Source: NATA Market Research Dept.

Table 37

Annual Key Telephone Systems Market, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	*CAGR Percent
1-24 Stations per System:							
Stations: thousands	3,180	3,113	3,149	3,209	3,214	3,191	.1
Systems: thousands	432.9	423.7	433.9	436.6	440.4	440.4	.3
Avg. Stations per System	7.3	7.3	7.3	7.3	7.3	7.2	
25-48 Stations per System:							
Stations: thousands	848	830	840	845	846	851	.1
Systems: thousands	28.8	28.2	28.5	28.6	28.6	28.3	- .4
Avg. Stations per System	29.4	29.4	29.5	29.5	29.6	30.0	
49+ Stations per System:							
Stations: thousands	212	207	210	205	200	213	.1
Systems: thousands	4.2	4.1	4.2	4.1	4.0	4.3	.5
Avg. Stations per System	50.2	50.2	50.2	50.2	50.1	50.1	
Total:							
Stations: thousands	4,240	4,150	4,199	4,259	4,260	4,255	.1
Systems: thousands	465.9	456.0	466.6	469.3	473.0	473.0	.3
Avg. Stations per System	9.1	9.1	9.0	9.1	9.0	9.0	
Value: $ millions	$1,039	$ 955	$ 957	$ 960	$ 965	$ 990	- 1.0

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(e)	*CAGR Percent
1-24 Stations per System:							
Stations: thousands	3,296	3,439	3,701	3,781	4,059	4,230	5.1
Systems: thousands	446.3	463.3	493.7	514.0	558.4	574.7	5.2
Avg. Stations per System	7.4	7.4	7.5	7.4	7.3	7.4	
25-48 Stations per System:							
Stations: thousands	879	905	974	1,073	1,168	1,275	7.7
Systems: thousands	29.3	30.2	32.6	35.9	39.1	42.5	7.7
Avg. Stations per System	30.0	30.0	29.9	29.9	29.9	30.0	
49+ Stations per System:							
Stations: thousands	220	181	195	256	333	290	5.7
Systems: thousands	4.4	3.6	3.9	5.1	6.6	5.8	5.7
Avg. Lines per System	50.2	50.0	50.1	50.2	50.2	50.2	
Total:							
Stations thousands	4,395	4,525	4,870	5,110	5,560	5,795	5.7
Systems: thousands	480.0	497.1	530.2	555.0	604.1	623.0	5.4
Avg. Stations per Systems	9.1	9.1	9.2	9.2	9.2	9.3	
Value: $ millions	1,050	1,100	1,125	1,175	1,250	1,275	4.0

(e) Estimated
* Compound Annual Growth Rate
(p) Projected

Source: NATA Market Research Department

Table 38

Key & Hybrid Shipments by Manufacturers' Distribution Channel, 1986-1988

	1986		1987		1988	
	Stations (thousands)	Share (percent)	Stations (thousands)	Share (percent)	Stations (thousands)	Share (percent)
Manuf. Direct	1,307	31.1	1,419	33.3	1,457	34.2
Interconnect	1,877	44.7	1,913	44.9	1,926	45.2
Wholesale Supply Houses	343	8.2	275	6.5	290	6.8
Bell Operating Co.	466	11.1	562	13.2	532	12.5
Independent Telco	206	4.9	90	2.1	55	1.3
Total	4,199	100.0	4,259	100.0	4,260	100.0

Source: NATA Market Research Department

Table 39

Installed Base of Key and Hybrid Market, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	*CAGR (Percent)
Total Stations: thousands	27,625	28,186	28,874	29,105	29,325	29,566	1.4
Total Systems: thousands	5,085	5,151	5,259	5,197	5,237	5,280	0.8
Average Stations/Systems	5.4	5.5	5.5	5.6	5.6	5.6	0.7

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(p)	*CAGR (Percent)
Total Stations: thousands	28,492	28,043	27,800	28,778	28,996	29,917	1.0
Total Systems: thousands	5,000	4,920	4,877	4,961	5,000	5,071	0.3
Average Stations/Systems	5.7	5.7	5.7	5.8	5.8	5.9	0.7

(e) Estimated
* Compound Annual Growth Rate
(p) Projected

Source: NATA Market Research Department

Table 40

1988 Key System Market Penetration, by End-Use Industry

	Percent
Banking/Finance	11
Engineering/Legal/Management	16
Government	8
Health/Education	15
Insurance	5
Manufacturing	10
Residential	1
Retail	15
Transportation	5
Wholesale	10
Other	4
Total	100

Source: Gartner Group

Table 41

Key/Hybrid Manufacturer Market Shares, by Stations Shipped, 1988, 1989(e) and 1990(p)

	1988	1989	1990
	- - - - Percent	- - - -	
AT&T	26	27	29
TIE	18	19	20
Executone	10	11	12
Toshiba	9	9	8
Inter-Tel	5	5	5
Comdial	4	4	5
Panasonic	3	3	2
Iwatsu	3	3	2
Alcatel/ITT	3	3	4
NEC	3	3	3
Trillium	2	2	2
Others	14	11	8
Total	100	100	100

(e) Estimated
(p) Projected

Source: NATA Market Research Department

DATA COMMUNICATIONS EQUIPMENT MARKET

INTRODUCTION--Data communications represents the growing overlap area between data processing and traditional communications. As the technologies of the two industries have merged, so have the applications of the technologies. With the proliferation of computers has come the concept of distributed processing. Traditionally, most computers have been of the mainframe-type and the users typically have had access through "dumb" terminals capable only of displaying stored information. If the terminal was not at the same location as the mainframe, a modem was necessary for communications through the telecommunications network. As computer technology evolved with more and more memory and processing available from smaller and smaller machines, mini computers and personal computers began to evolve. Now it has reached the point that much of the data processing being conducted is done away from the mainframe and the mainframe is used principally to manage extremely large databases or perform very complex data processing tasks.

The tremendous growth in distributed processing and computers in general has caused the data communications market to grow rapidly. In addition, there is a large and growing market for value added networks (VANs) such as credit card validation, electronic funds transfer, electronic mail, etc. that are having a significant impact on the demand for data communications equipment. Of the numerous types of data communications equipment, those addressed here include modems, multiplexers, packet switching equipment, front-end processors, concentrators, and network controllers.

Modems, which were developed in the early 1960s, are one of the oldest types of data communications products. The word "modem" is a contraction for modulator/demodulator. Modems are used to interface a computer with the telephone network. The modem converts the computer's binary code into a form that can be transmitted by telephone line using audio-frequency shift keying tones. At the other end a second modem converts the signal back to binary. Modems can be made to operate at different speeds, depending upon the system architecture at both ends.

Multiplexers are devices which cause the interweaving of several communications signals or channels to increase the capacity of a telecommunications network. This interweaving can either be done by frequency division, in which, each channel is allocated a different frequency within the wideband carrier; or by time division, in which each channel consists of a series of pulses, interleaved on a time-sharing basis. One of the more increasingly popular types of multiplexer is the T1 multiplexer. This device multiplexes channels through a T1 circuit. A T1 circuit is a high capacity, time-multiplexed transmission pipeline. It is being used increasingly to interconnect telephone company central offices, provide private voice and data networks, video transmission, long distance communications, etc.--basically any situation where high capacity and speed are necessary. Another advantage of T1 networks is the compatibility with digital PBXs, packet switching nodes, and asynchronous terminals.

Packet switches are devices that also increase the capacity of telecommunications networks by enabling a single channel to be used for multiple concurrent transmissions. This can be accomplished because the data to be transmitted to different destinations are formed into packets to which electronic addresses are assigned. The data are then sent as a continuous stream and switched to appropriate destinations by means of a packet switch. Packet switches are efficient for "bursty" high-speed data communications because lines are tied up only while data are transmitted. In contrast, circuit switching maintains an open connection even when no information is being transmitted. Data transmission over a packet-switched network can be at least 50 percent cheaper than over normal circuit-switched telephone lines. Packet switching networks are becoming very popular due to their use in VANs.

Front-end processors are auxiliary computers that are attached to a network to perform control operations, thus freeing up the host computer for data processing. Increasingly, software is being developed for the front-end processor that allows support of multiple host-computers, network diagnostics, and protocol conversion.

Concentrators are devices that perform a function similar to both multiplexers and packet switches in the sense that both types of equipment are designed to maximize the capacity of a given telecommunications transmission circuit. Concentrators can be of several different types. One popular type is a compression concentrator. This device compresses the data by reducing the number of bits required to represent a character, or a whole block of data, so that the user gains more transmission bandwidth.

LANs are dedicated data communications facilities providing high-speed switched connections, generally over a distance of less than a few miles, typically within a building or within a campus environment. Essentially, a LAN is a specialized private data network, designed to provide high-speed, high-bandwidth data transmission among a number of different types of data terminal equipment. LANs consist of a transmission medium, a network controller and a LAN gateway for interaction with the public network.

MARKET REVIEW--The data communications market has increased rapidly over the last several years from $3.2 billion in 1984 to $7.0 billion in 1989, and is expected to reach $10.9 billion by 1995 (see Table 42). Part of the increase in sales of data communications equipment can be attributed to increasing sales by interconnect companies. In an effort to increase profitability and customer satisfaction, interconnects have begun to broaden the scope of the their product and service offerings.

The market for modems grew at a rather healthy rate during 1984-87, but is expected to level off in the future, as the implementation of all-digital networks obviate the need for modems (see Fig. 38). It will be many years, however, before the entire telecommunications network is digital. In meantime, the proliferation of personal computers, especially in the home, will keep the demand for modems at a moderate level.

Products that maximize the capacity of a network, such as multiplexers, packet switching equipment, and concentrators, have recently become important as users begin to demand high speed data lines for the proliferation of new data networks. Network managers need to ensure that the capacity exists in the network to allow for continued growth of these networks.

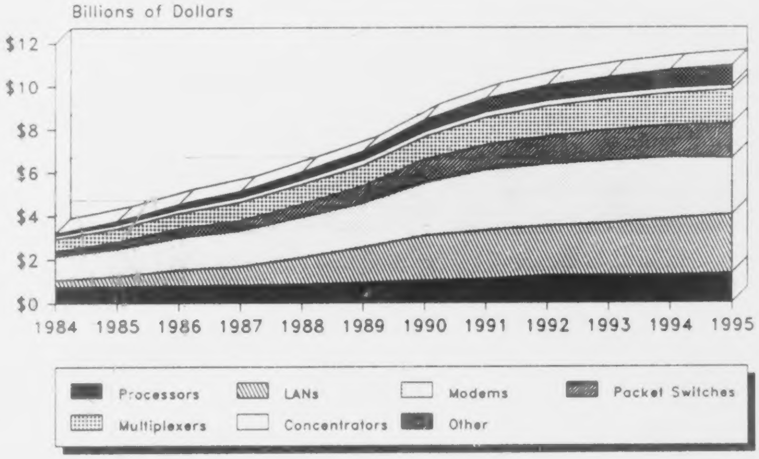
The market for multiplexers has grown steadily from $550 million in 1984 to $955 million in 1989. Growth is expected to accelerate in the next several years to reach $1.6 billion by 1995. This dramatic rise will result from increased use of T1 networks for data and voice transmission and ultimately for ISDN. Largely as a result of VANs, the market for packet switching equipment has increased from $225 million in 1984 to $800 million in 1989 and is expected to exceed $1.6 billion in 1995. The market for concentrators has increased from $165 million in 1984 to $230 million in 1989 and is expected to increase to $260 million by 1992 before the demand begins to drop with the implementation of ISDN, and the market turns downward and amounts to $235 million in 1995.

As communications to and between mainframe computers becomes commonplace, front-end processors will be required more and more to sort out the protocols and other aspects of communications. The market for these devices has increased moderately from $751 million in 1984 to $960 million in 1989, but is expected to increase more rapidly in the future and to amount to over $1.4 billion by 1995. Likewise, as the need for communications between personal computers grows stronger, LANs will become more popular, particularly for intraoffice communications. The market for LANs increased from $300 million in 1984 to $1.6 billion in 1989 and is expected to grow to $2.7 billion by 1995.

The channels of distribution for data communication products vary by type of product. The types of channels include computer dealers (independent and chain), systems integrators, manufacturer direct sales forces, wholesale supply houses, interconnects, value added resellers, value added distributors, and mail order houses. Because data communications are the middle ground between data processing and voice communications, it is sold by distributors of both types of products. In general though, products such as front end processors, which are used expressly with computers are sold more through computer-oriented outlets, while a T1 multiplexer, for instance, that is going to be used for voice communications might very well be sold by an interconnect.

FIGURE 38

Data Communications Equipment Market, 1984–1995



Source: NATA Market Research Dept.

Table 42

Data Communications Equipment Market, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	CAGR*
Equipment	- - - - - - - millions of dollars - - - - - - -						(Percent)
Front-end processor	751	790	815	845	896	960	5.0
Local area networks	300	450	700	840	1,200	1,600	4.0
Modems	1,100	1,266	1,500	1,650	1,840	2,025	13.0
Packet switching equipment	225	305	410	452	601	800	2.9
Multiplexers	550	613	700	840	910	955	11.7
T-1 multiplexers	80	150	174	275	340	500	44.2
Concentrators	165	180	197	209	219	230	6.9
Other	100	150	210	290	360	430	33.9
Total	3,191	3,754	4,532	5,126	6,026	7,000	17.0

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(p)	CAGR*
Equipment	- - - - - - - millions of dollars - - - - - - -						(Percent)
Front-end processor	1,055	1,125	1,275	1,282	1,295	1,350	5.0
Local area networks	2,020	2,210	2,251	2,375	2,550	2,685	5.9
Modems	2,450	2,785	2,850	2,875	2,850	2,625	1.4
Packet switching equip.	1,075	1,182	1,300	1,430	1,502	1,577	8.0
Multiplexers	1,050	1,250	1,375	1,425	1,460	1,550	8.1
T-1 multiplexers	550	650	790	950	1,100	1,250	18.0
Concentrators	250	250	260	250	225	235	-1.2
Other	550	620	710	785	840	910	10.6
Total	8,450	9,422	10,021	10,422	10,722	10,932	5.3

(e) Estimated
* Compound Annual Growth Rate
(p) Projected

FACSIMILE TERMINAL MARKET

INTRODUCTION--A facsimile terminal is a device that scans a document, encodes the information on the document, and transmits the document over a telecommunications circuit to be reproduced at the receiving end. The scanner sweeps across a page of the document, segmenting it into multiple lines in a fashion analagous to the way an electron beam scans the faceplate of a television picture tube. The scanner produces an output that is either a continuous analog signal that varies between black and white, or a digital output that converts the image to a binary code. Control equipment directs the scanning rate, and in the case of digital facsimile, it processes the signal to compress solid expanses of black or white. At the receiving end, the incoming signal is demodulated and drives a print mechanism that reproduces the received image on paper.

Facsimile transmission was invented in 1843. Despite this early introduction, facsimile transmission was not used very extensively until the 1920s, when it began to be used for transmitting wire photographs and weather maps. It has only recently become a business tool. Early models were bulky and produced rather poor quality copy. Recent innovations have made the facsimile terminal practical for a mass market.

Since facsimile transmission involves the coding of information, there must be standardization of the coding format to achieve universal intercommunication. The most prevalent standards currently in use have been established by the CCITT, a committee within the International Telecommunications Union, part of the United Nations. The CCITT has established three standards for facsimile transmission; another is under development. The three standards are referred to as Group 1, Group 2, and Group 3; the one under development is called Group 4. Group 1 requires six minutes for transmission of a printed page, Group 2 requires two to three minutes; and Group 3 requires one minute or less. Group 4 will be even faster.

MARKET REVIEW--The market for facsimile terminals has taken a number of years to reach the critical mass necessary for the market to take off. In terms of the value of the market, there was even a slight slump in 1985, when the market amounted to $164 million, down from $175 million in 1984 (see Table 43). Since 1985, however, the market has experienced tremendous growth. In 1989, the market amounted to 1.9 million terminals, valued at $2.9 billion. The market is expected to soar even more rapidly in the immediate future and reach 6.6 million terminals in 1995 valued at $6.5 billion. The growth of the relative market shares of the different CCITT group types are shown in Figure 39.

Faxs are sold through several different distribution channels. By far the most prevalent is through office-supply dealers. Sales through dealers accounted for 50 percent of the market in 1988 (see Fig. 40). Other important channels include retail, with 25 percent and manufacturer direct, with 20 percent. Sales through interconnects account for the balance.

There are dozens of suppliers of fax terminals, each trying to capture market share. The most popularly sold brand of fax terminal in 1988 was Sharp, with 20 percent of the market (see Fig. 41). Other important suppliers included Murata with 15 percent of the market, Canon with 11 percent, and Ricoh with 10 percent.

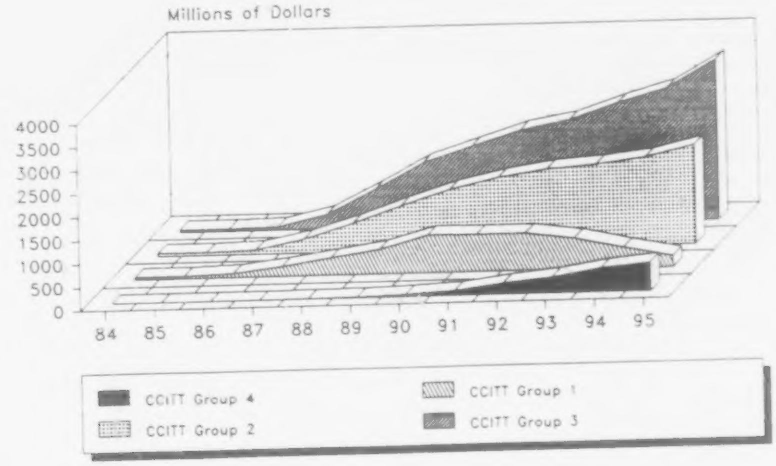
The growth in the installed base of fax terminals mirrors the growth in annual sales. The installed base increased steadily from

125 thousand units in 1984 to 2.8 million in 1989 and is expected to reach 15.2 million by 1995.

The industry sector that most commonly uses fax terminals is manufacturing. About 90 percent of all manufacturing facilities use fax transmission (see Fig. 42). Banking is next with 82 percent of all banks using faxs. Other industries which heavily use fax terminals include finance/insurance and transportation/utilities; both have 81 percent penetration rates. The lowest fax penetration is found in the government, with only 52 percent of government facilities using facsimile terminals.

FIGURE 39

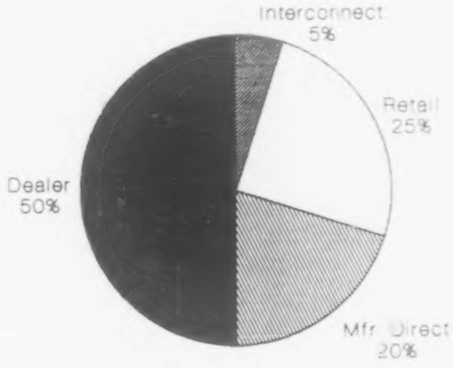
Facsimile Terminal Market, by Type, 1984–1995



Source: NATA Market Research Department

FIGURE 40

1988 Facsimile Terminal Distribution Channels

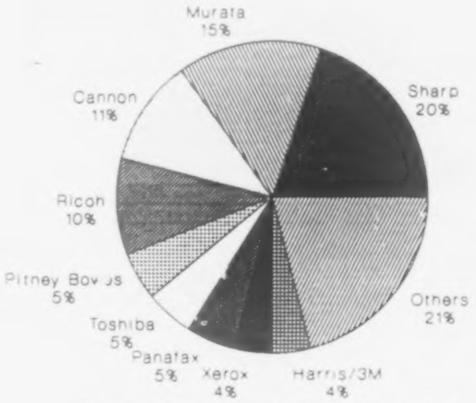


Total Market = 1.1 Million Units

Source: Estimated By the NATA Market Research Department Based on Various Industry Sources

FIGURE 41

1988 Facsimile Terminal Manufacturer Market Shares of Units Shipped

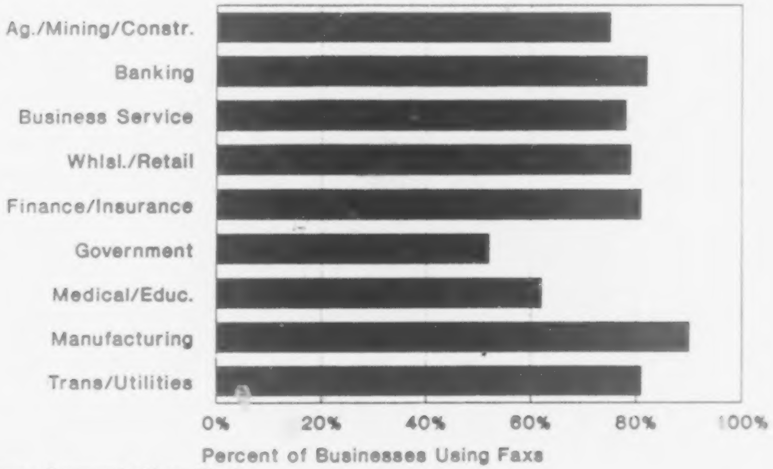


Total Market = 11 Million Units

Source: NATA Market Research Department

FIGURE 42

1988 Facsimile Terminal Penetration, By Industry



Source: Communications Week,
February 6, 1989

Table 43

Facsimile Terminal Market, 1984-1995

	1984	1985	1986	1987	1988(r)	1989(e)	CAGR*
							(Percent)
Annual Sales:							
Quantity: thousands	35	36	75	350	1,050	1,925	122.9
Total Value: $ millions	175	164	260	821	1,825	2,887	75.1
CCITT Group 1: $ millions	58	54	86	215	376	538	56.1
CCITT Group 2: $ millions	63	60	96	295	610	959	72.4
CCITT Group 3: $ millions	54	50	78	311	823	1,365	90.8
CCITT Group 4: $ millions	0	0	0	0	15	25	66.7
Installed Base: 1000 Units	125	160	225	570	1,100	2,855	187.0

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(p)	CAGR*
							(Percent)
Annual Sales:							
Quantity: thousands	2,750	3,375	4,065	4,575	5,763	6,573	19.0
Total Value: $ millions	3,850	4,457	4,958	5,361	5,723	6,476	11.0
CCITT Group 1: $ millions	817	810	805	675	450	250	-21.0
CCITT Group 2: $ millions	1,283	1,515	1,675	1,755	1,875	3,120	10.6
CCITT Group 3: $ millions	1,700	2,027	2,228	2,581	2,876	3,481	15.4
CCITT Group 4: $ millions	50	105	250	350	522	625	66.0
Installed Base: 1000 Units	4,422	6,571	9,500	11,374	13,210	15,159	28.0

(r) Revised
(e) Estimated
* Compound Annual Growth Rate
(p) Projected

Source: NATA Market Research Department

CONSUMER TELECOMMUNICATIONS MARKET

INTRODUCTION--The consumer telecommunications market had its roots over a hundred years ago when the telephone was invented. Over the years the telephone and the telephone system evolved to provide users with better service and more features. The telephone itself has evolved from an electromechanical to an electronic device. The switch to electronics began to occur in the 1960s and 1970s as the transistor gave way to its successor, the integrated circuit. With the conversion to electronics, advanced features became available. In the late 1970s the cordless telephone and the consumer telephone answering machine developed. On the horizon for consumer telecommunications is the ISDN, which will provide consumers with the ability to achieve voice, data, and video communication through a video telephone terminal. Common services most likely to be available will be catalogue browsing and purchasing, electronic mail, electronic banking, etc. This study however, addresses only the U.S. market for corded telephones, cordless telephones and telephone answering machines.

Over 90 percent of households in the United States have telephone service. That represents a large market for telephone instruments. Since the late 1960s, consumers have been legally able to buy and install telephone equipment. However, the market did not take off until the 1980s. During 1982-84, cheap, one-piece telephones became very popular, and millions of them were sold. Their popularity died out, however, due to lack of good sound quality and reliability. Currently, the market for consumer phones is driven by features such as hold, speed dialing, mute, liquid crystal displays, etc.

MARKET REVIEW--The market for all types of corded telephones increased from $1.2 billion in 1984 to $1.9 billion in 1989 (see Table 44 and Fig. 43). It is expected to increase to $2.9 billion by 1995. The market for full-feature phones has been the fastest growing segment, increasing from $110 million in 1984 to $750 million in 1989, and is expected to exceed $1.9 billion by 1995. The changes in relative market shares of the different types of phones is presented in Figure 43.

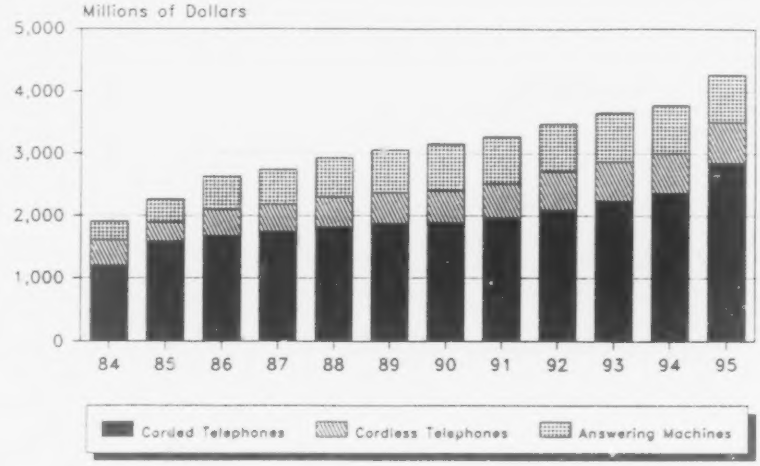
The market for cordless telephones also went through a period of extreme popularity in the early 1980s, but began to fizzle as problems with unauthorized use (or monitoring), sound quality, and reliability became apparent. New models, using different frequencies and having increased protection from unauthorized use became available in the mid-1980s. The market for cordless telephones decreased from $410 million in 1984 to $305 million in 1985 before increasing to $498 million in 1987.

The market for telephone answering machines has increased from $298 million in 1984 to $680 million in 1989. The demand for telephone answering machines has been held in check by reluctance on the part of some consumers to "talk into a machine." This reluctance, however, is being overcome as our society becomes dominated by families where both spouses work and where there are large segments of time during the day when no one is home. In addition, more businesses are installing voice messaging systems (discussed in the next section), which is making the general public more comfortable with leaving a message. Also, the BOCs were recently granted the ability to offer voice messaging services. Undoubtedly, before long, there will be BOC advertising campaigns under way across the country which will familiarize people with the benefits of talking into a machine. By 1995 the market is expected to reach $765 million.

Consumer telecommunications products are typically sold through the retail channel. According to figures compiled from Telecommunications Equipment Retailer, the national average of sales per retail store selling consumer telecommunications equipment amounted to $485,185 in 1988, with the highest sales per store being registered in the Midwest and the lowest sales per store registered in the Southeast, where the average sales per store was $208,571 (see Table 45).

FIGURE 43

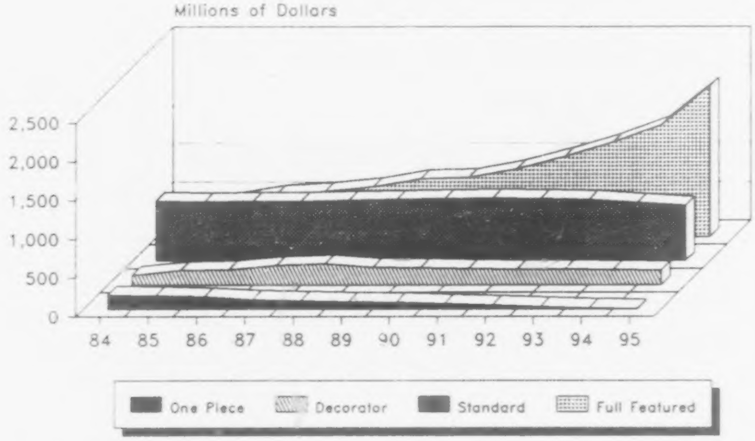
Consumer Telecommunications Equipment Market, 1984–95



Source: Various Industry Sources

FIGURE 44

Corded Telephone Instrument Market, by Type, 1984–95



Source: Various Industry Sources

Table 44

Consumer Telecommunications Marketplace, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	CAGR* (Percent)
Corded Telephone Instruments:							
Standard:							
Value: $ millions	775	765	770	775	788	795	5.1
Quantity: million units	26	27	29	31	34	34	5.5
One Piece:							
Value: $ millions	185	180	162	129	115	100	11.6
Quantity: million uits	12	12	11	10	10	9	12.1
Decorator:							
Value: $ millions	130	190	207	257	275	230	12.1
Quantity: million units	2	3	3	4	5	5	2.0
Full-featured:							
Value: $ millions	110	450	551	589	647	750	47.0
Quantity: million units	1	2	3	4	5	6	43.1
Total:							
Value: $ millions	1,200	1,585	1,685	1,750	1,825	1,875	9.3
Quantity: million units	41	44	46	49	53	54	5.7
Cordless Telephones:							
Value: $ millions	410	305	410	438	474	498	4.0
Quantity: million units	4	3	4	4	5	5	4.6
Telephone Answering Machines:							
Value: $ millions	298	371	535	557	634	680	17.9
Quantity: million units	4	5	7	7	9	9	17.6

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(e)	CAGR* (Percent)
Corded Telephone Instruments:							
Standard:							
Value: $ millions	805	810	805	790	755	715	-2.3
Quantity: million units	35	35	36	36	35	34	-0.6
One Piece:							
Value: $ millions	95	75	55	35	20	10	-36.3
Quantity: million uits	9	8	6	4	3	2	-26.0
Decorator:							
Value: $ millions	225	215	205	205	200	195	-3.0
Quantity: million units	5	5	4	4	4	4	-4.4
Full-featured:							
Value: $ millions	765	875	1,035	1,220	1,440	1,943	20.5
Quantity: million units	6	7	9	10	12	15	20.1
Total:							
Value: $ millions	1,890	1,975	2,100	2,250	2,375	2,863	8.7
Quantity: million units	55	55	55	54	54	55	**
Cordless Telephones:							
Value: $ millions	515	535	612	625	630	650	4.8
Quantity: million units	6	6	7	7	8	9	8.4
Telephone Answering Machines:							
Value: $ millions	750	770	790	780	775	765	0.4
Quantity: million units	10	11	11	12	12	13	5.4

(e) Estimated
(p) Projected
* Compound Annual Growth Rate
** Less than .05 percent

Source: NATA Market Research Department

Table 45

1988 Telecommunications Retail Market, by Region

	West	South West	East	South East	Mid West	National
1988 Sales Per Store	$430,270	$237,308	$310,429	$208,571	$1,065,385	$485,185
1988/1987 Growth	42%	10%	45%	39%	15%	27%
Avg. No. of Outlets	2.4	1.0	1.1	1.0	3.4	1.9
Avg. No. of Employees per Store	4.6	5.9	4.4	3.6	5.1	4.8
Avg. Sales/Employee	$101,401	$ 40,065	$ 67,906	$ 56,153	$ 74,462	$ 75,741

Source: Telecommunications Equipment Retailer, December 1988

CALL/VOICE PROCESSING EQUIPMENT MARKET

INTRODUCTION--The type of equipment discussed in this section answers, records, routes, distributes, makes, or otherwise manipulates telephone calls. The specific products addressed are voice messaging systems, automatic call distributors, and automatic dialers. Probably the most popular of the three is the voice messaging system, a product that has been around in its present form since the early 1980s. Voice messaging, also called voice mail, is sometimes available as an optional feature on a PBX, but frequently it is a separate piece of equipment used as an adjunct to a business telecommunications system. A caller dials the called party's mailbox number and leaves a message. The called party can retrieve messages by dialing the mailbox from any touch-tone telephone and entering a security code. By entering instructions using the key pad, the message can be repeated, erased, or filed.

Compared to an ordinary consumer answering machine, voice mail gives the called party more flexibility. Voice messaging systems have become popular, especially with businesses, by reducing the need for an operator/receptionist/secretary to answer calls and take messages. Some studies estimate that 50 percent of all telephone calls made are simply to convey information and do not require a two-way conversation. In many cases, the age-old game of "telephone tag" can be cut considerably, if not eliminated.

An automatic call distributor (ACD) is a device that concentrates incoming calls to a group of service positions. An ACD is either a stand alone system or included as a feature in a PBX. Typical applications are the service departments of large, high-telephone-traffic organization such as airlines, utilities, catalog houses, and department stores. Incoming calls can be routed to an attendant position on the basis of incoming line type or other variables. When attendant positions are idle, the call is routed immediately. When the attendant positions are busy, the calls are answered and placed in a queue and the caller is notified by a recorded announcement that the call will be held until the next available operator is free.

Voice response systems incorporate some voice messaging-like features with other equipment, such as automated attendants and data base management equipment, to provide automated call processing functions. Typically, these integrated voice response systems are made up of hardware and software customized for an individual customer or type of customer.

Voice response systems can be interactive or noninteractive. An interactive system answers a call, gives the caller options from which to select, accepts responses entered by the caller using the telephone keypad, and allows the caller to access a data base and make some change to that data base. For example, a bank might have an interactive voice response system that would allow a customer to access his\her account, transfer funds, pay a credit card bill, etc. A noninteractive system simply gives the caller options, accepts the caller's choice of options, processes the caller's options by interacting with some external data base, and finally provides verbal information regarding the transaction. As an example, a centralized, city-wide events ticketing bureau might maintain a noninteractive voice response system whereby a caller would call up and, through a menu, ask for the time, date, and place of a particular event. The system would search through a data base, find the information, and perhaps through synthesized speech respond to the caller's inquiry.

MARKET REVIEW--The market for call/voice processing equipment has increased from $112 million in 1984 to $1.5 billion in 1989 (see Table 46). Most of this equipment is distributed and installed by the interconnect industry. These products have been some of the key add-on peripherals that interconnects have begun to sell to increase profit margins and customer satisfaction.

The principal product area is the voice messaging equipment market, which increased from $5 million in 1984 to $623 million in 1989 (see Figure 45). The market for this equipment is expected to increase to about $1.2 billion by 1995. In addition, the FCC recently decided to allow telephone companies to offer voice messaging services. While many analysts believe this will stimulate the market, others are concerned that the initiative may lead to a shakeout of voice processing manufacturers due to the extensive resources available to the telephone companies and the possibility of anti-competitive activities.

The equipment market is spread widely over a number of suppliers. The largest market share in 1988 went to Octel, with 16 percent, followed by Rolm and VMX\Opcom, both with 15 percent, AT&T with 11 percent, and Centigram with 10 percent (see Fig.47)

The market for voice response systems increased from $10 million in 1984 to $350 million in 1989. The market for these products will increase rapidly as consumer acceptance and new applications develop. By 1995, the market will match the value of the voice messaging equipment market and amount to $1.2 billion.

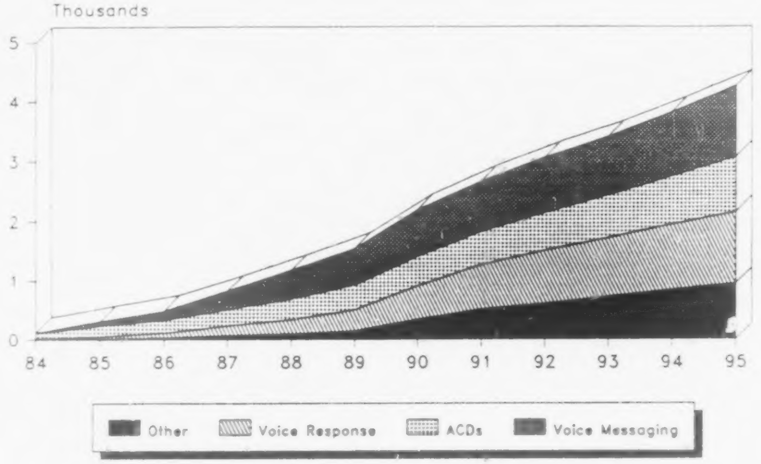
As with the voice messaging marketplace, the voice response equipment market has a number of suppliers, none of which dominate the market. The largest market share in 1988 went to Perception and Syntellect, both with 9 percent of the market, followed by Intervoice with 7 percent (see Fig. 47)

The other types of equipment are more niche-type products. Even so, the market for ACDs has increased from $95 million in 1984 to $425 million in 1987 and is expected to amount to $915 million in 1990. The market for ACDs is dominated by several suppliers. In 1988 Rockwell had 43 percent of the market, Teknekron had 29 percent, and Telecom Technologies had 20 percent (see Fig. 48)

Other types of products included in this category of products include stand-alone automated attendants (most automated attendants are incorporated features in a PBX or voice/call processing unit), speech recognition devices, voice synthesizers, auto dialers, and similar equipment. The market for these products is expected to expand substantially through the next several years. Particularly noteworthy are speech recognition and voice synthesis. These technologies will develop rapidly and add a new dimension to voice/call processing. Once perfected and available in commercial quantities at moderate price levels, they will represent a significant impetus for the growth of all voice/call processing markets as they greatly expand the functionality and flexibility of the different systems.

FIGURE 45

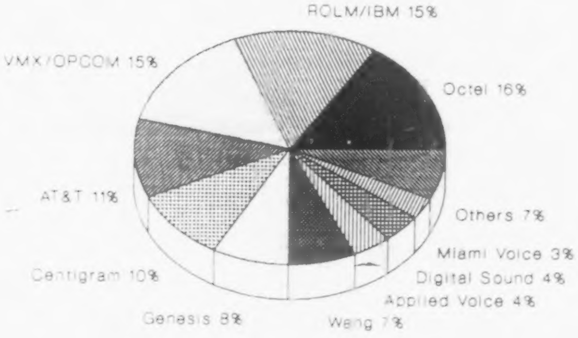
Call/Voice Processing Equipment Market, by Type, 1984–95



Source: NATA Market Research Department

FIGURE 46

1988 Voice Messaging Equipment Market, by Vendor

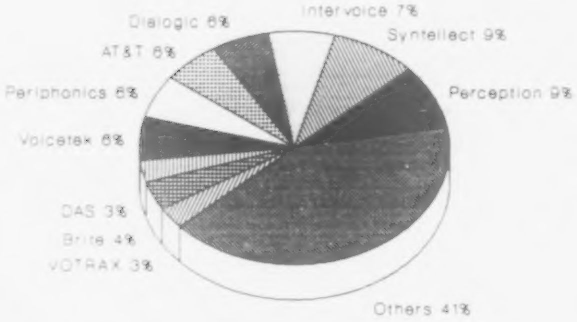


1988 Total Market = $500 Million

Source: NATA Market Research Department

FIGURE 47

1988 Voice Response Equipment Market, by Vendor

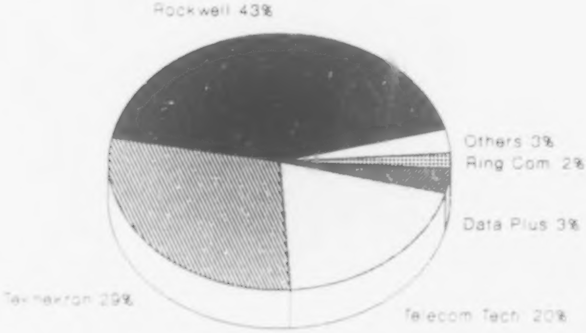


1988 Total Market = $235 Million

Source: Estimated by the NATA Market Research Dept. based on figures of Vanguard Communications Corporation.

FIGURE 48

1988 Stand-Alone ACD Market, by Vendor



Total 1988 Market = $350 Million

Source: Estimated by the Market Research Department based on various industry estimates.

Table 46

Voice/Call Processing Marketplace, 1984-1995

	1984	1985	1986	1987	1988	1989	CAGR*
							Percent
Voice Messaging Equipment	5	75	150	315	500	623	162.5
Voice Processing Equipment	10	35	75	160	235	350	103.6
Automatic Call Distributors	95	183	228	285	350	425	35.0
Other **	2	15	30	70	100	150	137.1
Total	112	308	483	830	1,185	1,548	169.1

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(p)	CAGR*
							Percent
Voice Messaging Equipment	775	842	917	975	1,072	1,180	8.8
Voice Processing Equipment	563	755	905	995	1,095	1,205	16.4
Automatic Call Distributors	500	550	630	715	805	915	12.8
Other **	350	520	610	725	845	950	122.1
Total	2,188	2,667	3,062	3,410	3,817	4,250	14.2

(r) Revised
(e) Estimated
* Compound Annual Growth Rate
** Includes stand-alone auto attendants speech recognition, voice synthesis, and similar equipment

Source: NATA Market Research Department

PUBLIC PAYPHONE MARKET

INTRODUCTION--The pay telephone was invented in 1889 by William Gray. Working part time for Gray, George Long, a 16-year old apprentice at Pratt & Whitney Co. built the first coin operated telephone which was installed in the Hartford Bank in Hartford, Connecticut. The pay telephone became very popular and attracted the attention of AT&T. In 1910, the Gray Telephone Pay Station Co. and AT&T joined forces to produce pay telephones. That arrangement lasted until 1934 when Gray sued AT&T for patent infringement and lost. AT&T soon became the only major commercial producer of pay telephones. This lasted until recently, when other domestic producers and foreign producers began vying for a piece of the growing payphone market.

For virtually its entire 100-year lifetime, the pay telephone has been owned and operated by the local exchange telephone company (LEC). In June 1984, the FCC opened the interstate pay telephone equipment market to competition. The FCC ruled that parties other than telephone companies may own pay telephones connected to the interstate telephone network, provided that the equipment is registered under Part 68 of the Commission's rules and regulations. At the time the FCC made its ruling, there were approximately 1.8 million telco-owned pay stations throughout the United States.

The operator service providers (OSP) industry is an industry that has developed as a result of the growing need by nonLEC payphone operators of access to operator services which the long distance carriers do not provide them. The OSP industry are those companies that provide the same type of operator service that the local and long distance telephone companies do when a caller dials "0." Some of the operators of nonLEC payphones are also OSPs. While this is a parallel industry to the private payphone industry, the discussion in this report will focus on the payphone market. While the 1984 FCC ruling opened the way for entrepreneurs to connect telephones to the interstate telephone network, the terms and conditions for connecting the payphones for local and intrastate calling were left to the states. As a result, while the market is growing rapidly, payphone regulations vary widely across the states.

NonLEC-owned pay telephones are different from their telco-owned counterparts in that the nonLEC-owned units must be able to perform many of the call processing functions traditionally associated with the central office. These functions can be controlled remotely through a personal computer.

Payphones are now capable of offering many advanced features not available in 1984. Some of the advanced features include credit card calling, voice synthesizers that provide usage information to the caller, accounting functions, and self diagnostics. Some payphones are becoming so sophisticated that new terminology is developing to describe them--public access terminals. These stations offer fax, voice messaging, audiotex, speed dialing, and other innovative features. Most of these features are available only on the nonLEC-owned payphones, but the telcos are beginning to recognize their importance and are beginning to install the more sophisticated types and even retrofitting many of their older phones to have advanced features.

MARKET REVIEW--The annual market for payphones increased from 20 thousand units valued at $35 million in 1984 to an estimated 140 thousand units valued at $150 million in 1990. It is expected that sales of payphones will continue to grow rapidly and amount to 225 thousand units valued at $215 million by 1995. Moreover, while the average unit price is decreasing, the average level of sophistication of the payphone is increasing.

In terms of the installed base, telco-owned payphones amounted to about 1.9 million units in 1988, with the BOCs alone accounting for about 1.7 million units. This is expected to remain relatively stable over the next several years. The installed base of nonLEC-owned pay telephones has been estimated at up to 200,000 units. This is expected to double by mid 1991. By then, nonLEC-owned payphones will account for some 20 percent of the installed base. Figure 49 shows the relative shares of the installed base between telco-owned and nonLEC payphones for 1984-1995.

In comparing market penetration of nonLEC-owned payphones with that of BOC-owned payphones, the most significant inroads of private operators have been made in the Pacific Telesis territory, where the BOCs own 156,700 and private companies own 27,700. Private operators have been least successful in the Ameritech territory, where the BOCs own 230,400 payphones and private operators own 18,100 pay phones. Many of the disparities are accounted for by differing regulatory environments and the significance of certain particular major contracts that have been awarded.

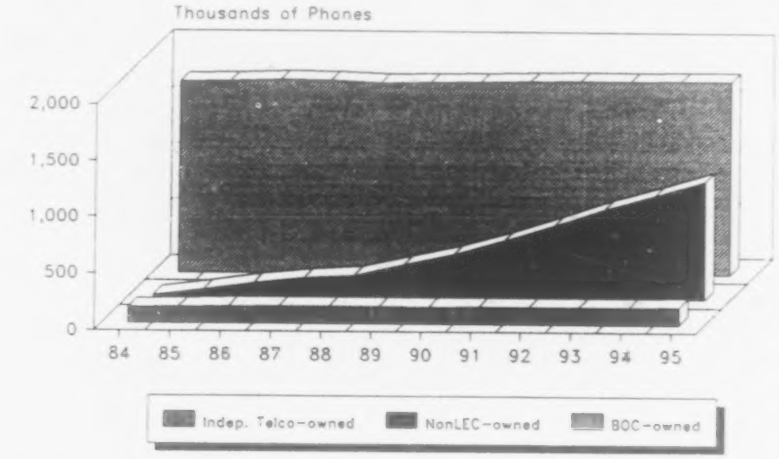
One very important regulatory development that will likely have a long-term effect on the nonLEC payphone marketplace is the notion of presubscription for "0 +" traffic (phone calls placed on a payphone that are paid for in some way other than having the caller drop coins in the slot). In October 1988, Judge Harold Greene ruled that all location owners that have BOC payphones on their premises must select an interexchange carrier to handle "0 +" traffic. The implementation of this ruling is not yet complete, and there are certain elements that may be reconsidered. As a result, the full implications to the industry are not yet known, but, whatever the final outcome, the effects will be longlasting.

Regardless of the outcome of the implementation of this and other regulations involving the private payphone industry and associated industries such as the alternative operator services industry, one thing is clear. Private payphone operators provide very valuable services to users. As the regulatory environment becomes more stable and innovative applications emerge, private payphone operators are likely to continue to be a viable, attractive alternative to the local telephone company for pay telephone services.

RBOC revenue generated from public payphones increased from $1.5 billion in 1984 to $1.7 billion in 1987 (see Fig. 51). It is expected to increase slowly to $1.8 billion by 1995. As a share of the total, revenue from coin calls decreased during 1986-87, and is expected to continue to decrease through 1990. Non-coin revenue is almost exclusively attributed to toll calls.

FIGURE 49

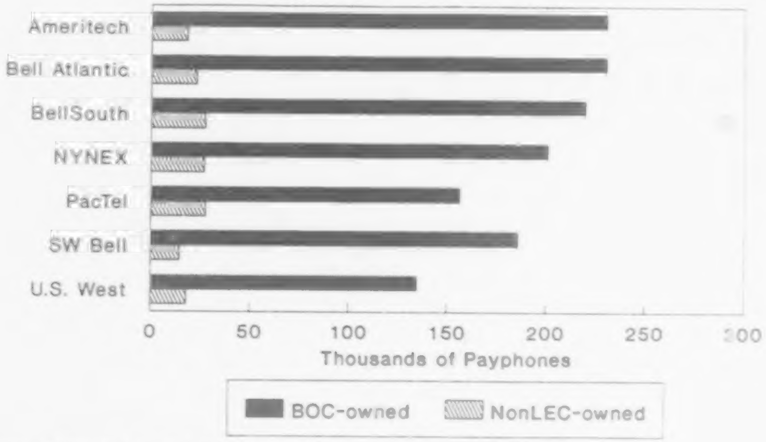
Public Payphone
Installed Base, 1984–95



Source: NATA Market Research Department

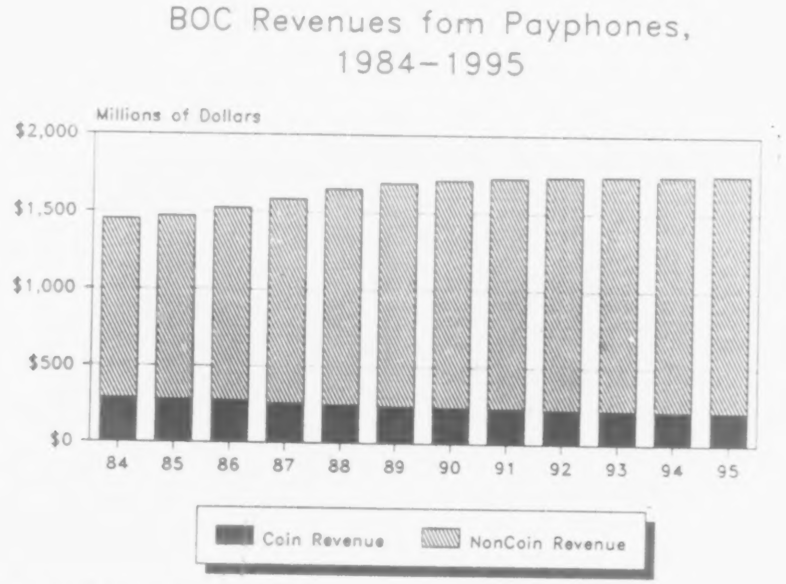
FIGURE 50

1988 BOC-owned Vs. NonLEC-owned
Payphones, by Region



Source: Estimated by the NATA Market
Research Department based on Various
Industry Sources

FIGURE 51



Source: NATA Market Research Department

Table 47

Public Payphone Marketplace, 1984-1995

	1984	1985	1986	1987	1988	1989(e)	CAGR* (Percent)
Annual Sales:							
Quantity: thousands	20	23	27	45	90	140	47.6
Value: $ millions	35	37	40	60	100	150	33.8
Installed Base:							
BOC Owned: thousands	1,695	1,700	1,715	1,708	1,690	1,695	**
Independent telco: thousands	135	138	145	147	149	147	2.0
Non-telco-owned: thousands	25	75	135	175	200	295	64.0
BOC Public Payphone Revenue:							
From Coin Calls: $ millions	290	279	275	260	250	240	- 3.7
Other: $ millions	1,162	1,191	1,250	1,325	1,400	1,450	4.5
Other Payphone Related Revenue: $ millions***	1,100	1,450	1,900	2,275	2,375	2,400	17.0

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(e)	CAGR* (Percent)
Annual Sales:							
Quantity: thousands	175	185	197	205	215	225	5.2
Value: $ millions	185	190	200	200	205	215	3.1
Installed Base:							
BOC Owned: thousands	1,700	1,710	1,713	1,715	1,718	1,720	0.2
Independent telco: thousands	145	149	147	147	149	152	0.9
Non-telco-owned: thousands	385	510	650	795	920	1,050	1.8
BOC Public Payphone Revenue:							
From Coin Calls: $ millions	235	230	225	220	217	215	- 1.8
Other: $ millions	1,475	1,495	1,510	1,520	1,527	1,535	0.8
Other Payphone Related Revenue: $ millions***	2,550	2,750	2,975	3,090	3,175	3,260	5.0

(e) Estimate
(p) Projected
* Compound Annual Growth Rate
** Less than .05 percent
*** Principally revenue to long-distance carriers and operator service providers

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MOBILE COMMUNICATIONS MARKET

INTRODUCTION

In the context of this report, mobile communications encompasses networks that allow individual users to communicate with other users, where at least one of the persons is using a device connected to the network through radio transmission. In other words, left out of discussion here are satellite communications links, infrared communications, etc. The two most popular forms of mobile communications, and the two addressed in this report include mobile telephony, i.e., cellular radiotelephony, and radio paging.

CELLULAR RADIOTELEPHONY

Cellular telecommunications systems represent the newest generation of radiotelephone systems. Radiotelephones have been around for many years, but were limited in market penetration due to the scarcity of radio frequency available. Cellular telecommunications solves that problem by dividing a geographic area into cells and reusing the frequencies in nonadjacent cells (see Fig. 22). Each cell has a low power transmitter which can transmit only within a limited area. When a person with a cellular phone travels from one cell to another, the call is "handed off" to the transmitter of the second cell. These two aspects of frequency reuse and handing off allow for a great many more subscribers than traditional mobile telephone systems.

While cellular technology has been around for a number of years, the commercial implementation of the technology had to receive approval by the Federal Communications Commission (FCC).

Introduction of cellular service on a commercial scale occurred in 1984. The FCC mandated that there be two systems operators per market area, one of which was designated to be a cellular subsidiary of the local telephone company. The awarding of the licenses for the other systems became chaotic as the revenue potential became known and the FCC was flooded with applications. At the end of 1987 there were 215 systems on-line in 160 cities.

In general, the cellular industry consists of four segments: manufacturers of cellular telephones; manufacturers of cellular systems (and system components); and operators of cellular systems. In addition, other miscellaneous segments have developed that feed off one or more of the four main sectors. One example is the cellular telephone reseller. This type of company markets to potential cellular subscribers and receives a commission from the system operator for every subscriber he/she signs up.

CELLULAR MARKET REVIEW

The total number of cellular subscribers in the United States has increased from 91.6 thousand in 1984 to 2.6 million in 1989 and is expected to soar to 18.1 million by 1995 (see Table 48). Cellular telephones, originally marketed principally to business people, are becoming a consumer product. The prices of the phones themselves have decreased from $2,000-$4,000 per phone three to four years ago to $300-$500 today for a basic phone. Recent inroads made by producers in Hong Kong, Singapore, and South Korea indicate that the price of the phones is likely to fall further.

There are three different types of cellular telephones: mobile (used primarily in an automobile), transportable (used either in an automobile or converted and carried in a pouch to be used portably), and hand-held portable ("pocket-sized" to be used portably). There are some 15 suppliers of cellular phones to the U.S. market. The largest U.S.-based supplier is Motorola. Significant foreign-based suppliers include Toshiba, NEC, Panasonic, Uniden, Mitsubishi, and Oki.

According to some industry sources, Motorola has the lion's share of both the mobile and the hand-held portable markets, with 37 percent and 40 percent, respectively of the two markets. In the transportable market, Motorola comes in a distant fourth with 12 percent, behind Panasonic (26 percent), Mitsubishi (17 percent), and Uniden (16 percent).

There are two principal suppliers of cellular systems in the U.S. marketplace: Motorola and AT&T. With roughly equally portions, Motorola and AT&T, together, account for over 80 percent of the number of systems installed. In general, AT&T has been more successful with the BOCs' cellular subsidiaries, while Motorola has been very successful with the nonLEC (nonwireline common carrier) market.

The annual capital investment costs of the cellular systems operators have increased from $234 million in 1984 to $700 million in 1987 (see Fig. 52). Service revenues have increased from $178 million in 1984 to $1.8 billion in 1989. The anticipated growth in revenue has spurred tremendous activity with franchise operators. Mergers and aquisitions have become commonplace. BOC cellular subsidiaries are crossing over into other BOC regions to become the competing carrier. BellSouth has been particularly aggressive in acquiring competing cellular franchises.

Aside from the price of the phones themselves, the other impediment to the mass market is the monthly price of the service. That too is dropping, although not quite as rapidly as the prices of the phones. The service is generally still more costly than regular telephone service, but as the number of subscribers increase, the cheaper it will become, as the marginal cost per subscriber decreases.

Beginning in 1990, the cellular telecommunications network will begin to convert to digital technology. While the current analog systems have tremendous capacity compared to what was available before, there are practical limitations to the number of subscribers per system. For a given amount of radio frequency, digital technology will allow the systems to have significantly more subscribers than analog systems. In addition, there are technical reasons which make digital technology superior to analog. Once the digital systems are in place, the marginal cost per subscriber will likely decrease dramatically. At that point, it is projected that cellular will become a relatively inexpensive consumer product/service and according to industry sources may reach penetration levels of 50 percent of the population (Fig. 53).

RADIO PAGING NETWORKS

In general, paging systems fall into two categories: low capacity, typically private, systems used in environments such as hospitals and campuses; and high-capacity radio paging systems typically administered by the local telephone company or a radio common carrier. The types of messages that can be sent over the different systems include voice messages (only available in a low-capacity system), tones (or beeps), visual displays, or any combination of these. Low capacity systems, which usually cannot have a subscriber base of more than about two hundred, frequently transmit tone and voice messages. High-capacity systems usually are able to have a subscriber base of several thousand.

While paging services are used throughout the economy, several sectors find such services to be particularly useful. Approximately one-third of all pagers are used in service industries. The construction, transportation, utilities, and communications sectors are also large users, each accounting for about 15 percent of pagers in operation.

PAGING MARKET REVIEW

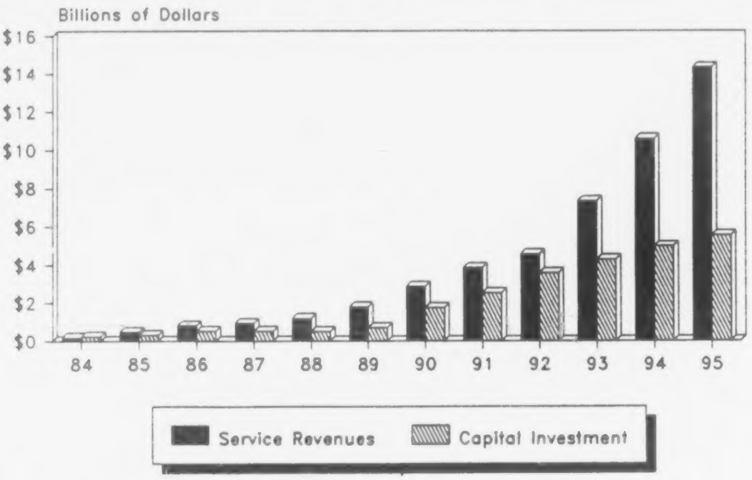
The annual market for radio pagers has increased steadily over the past several years from some 1 million pagers valued at $250 million in 1984 to almost 3 million pagers valued at $490 million in 1989. Annual sales are expected to amount to 8.2 million units valued at $790 million by 1995.

About 59 percent of the pagers in use are capable of numeric messages; about 25 percent of the pagers in use are capable of tone only; 12 percent combine tone and voice; and the balance capable of full alphanumeric messages (see Figure 54). The marketplace has become very competitive with a number of suppliers jockeying for market share. The undisputed leader is Motorola, with 68 percent of the installed base (see Fig. 55). NEC is a distant second with 18 percent. Panasonic has about 6 percent and Multitone, through its Radio Shack sales, has garnered 3 percent of the market.

The market is likely to continue to be dynamic over the next several years with the total number of subscribers expected to reach 28 million, up from 9.4 million in 1989. New growth will come about as a result of innovative product design, as in the new wristwatch pager, and alternate channels of distribution, as in case of Multitone's success at selling through Radio Shack stores.

FIGURE 52

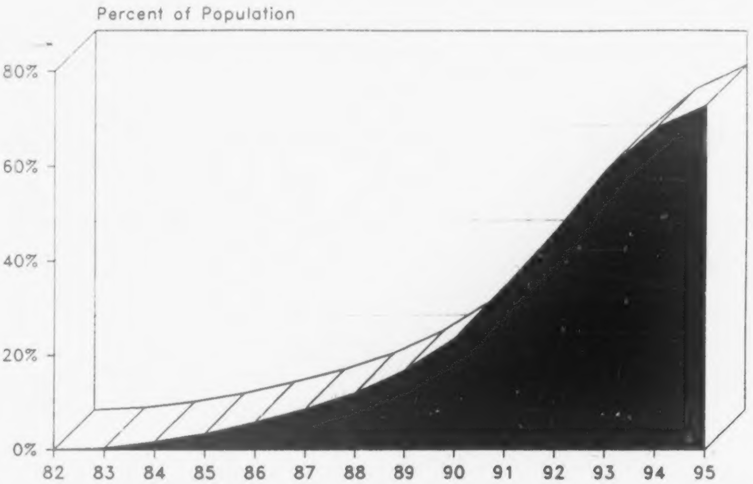
Cellular Service Revenues and Annual Capital Investment, 1984–95



Source: U.S. Department of Commerce

FIGURE 53

U.S. Cellular Penetration



Source: NATA Market Research Dept.
Based on Various Industry Sources

Table 48

Mobile Communications Marketplace, 1984-1995

	1984	1985	1986	1987	1988(r)	1989(e)	CAGR*
							Percent
Radio Pagers:							
Annual Sales Value:							
$ millions	250	299	352	399	430	490	14.4
Annual Sales Volume:							
$ millions	1.0	1.3	1.6	1.9	2.3	2.8	22.9
Pagers In Use:							
millions	3.8	4.5	5.4	6.5	7.8	9.4	19.9
Cellular Marketplace:							
Telephones:							
Annual Sales Value:							
$ millions	187	575	785	875	1,013	1,456	50.8
Annual Sales Volume:							
thousands	75	280	393	475	675	1,120	72.0
Subscribers:							
thousands	92	340	682	1,100	1,775	2,577	10.0
Network Equipment:							
Annual Sales:							
$ millions	234	322	526	526	500	700	24.5
Systems on Line:							
Number	33	105	171	312	450	510	73.0
Service Rev.:							
$ millions	178	482	823	960	1,204	1,800	59.0

	1990(p)	1991(p)	1992(p)	1993(p)	1994(p)	1995(p)	CAGR*
							Percent
Radio Pagers:							
Annual Sales Value:							
$ millions	490	500	550	695	700	790	10.0
Annual Sales Volume:							
$ millions	3.2	4.0	4.7	5.6	6.8	8.2	21.0
Pagers In Use:							
millions	11.2	13.5	16.2	19.4	23.3	28.0	20.1
Cellular Marketplace:							
Telephones:							
Annual Sales Value:							
$ millions	1,773	1,877	1,905	2,034	2,371	2,452	6.7
Annual Sales Volume:							
thousands	1,760	2,175	2,715	4,519	6,775	8,950	38.4
Subscribers:							
thousands	4,020	5,235	7,536	10,043	14,778	18,100	35.1
Network Equipment:							
Annual Sales:							
$ millions	1,757	2,535	3,576	4,277	4,978	5,533	21.0
Systems on Line:							
Number	550	590	600	600	605	605	2.0
Service Revenue:							
$ millions	2,875	3,855	4,575	7,326	10,573	14,328	38.0

(r) Revised
(e) Estimated
* Compound Annual Growth Rate
(p) Projected

Source: Estimated by NATA Market Research Department
based on various industry sources

PUBLIC POLICY OVERVIEW

PUBLIC POLICY OVERVIEW

The past year (this article covers the period from October 1988 to September 1989) has been a transitional one in telecomunications public policy. The Presidential election in November 1988 brought a new Administration into power and with it new faces with their own set of programs and priorities. As in any new administration, it takes many months for all the new players to get into place (some are still not there at this writing), and even more time for those new players to settle in and get the lay of the land. As a result, the past year has not seen many new policy initiatives from the Executive branch. President Bush has named most of his team for telecommunications and they are undertaking some thorough reviews of MFJ and other issues. At the Commerce Department, Robert Mosbacher, a long-time Bush friend and supporter, was named Secretary. As Mosbacher has himself made clear on numerous occasions, his top priority is to push for policies which he believes will enhance the competitiveness of American business around the globe. Named as head of the National Telecommunications and Information Administration (NTIA) was Janice Obuchowski, formerly an aide to Dennis Patrick at the FCC on Common Carrier matters and more recently the executive director of international affairs for Nynex.

After months of speculation, Bush named three to fill vacancies on the FCC. Alfred Sikes, formerly head of NTIA under the Reagan Administration, was named the new FCC Chairman. In his former role, Sikes was known as an ardent champion of allowing the BOCs into manufacturing and information services. His comments and actions since being named to the FCC, however, indicate that he views the two roles very differently. He has stated that he supports modifications in the MFJ which contain competitive and consumer safeguards.

Named to the other two FCC seats were Andrew Barrett, a former member of the Illinois Commerce Commission, who will serve out the balance of former FCC Chairman Mark Fowler's term, until June 30, 1990. Barrett is expected to be reappointed at that time. Also named was Sherrie Marshall, an attorney formerly with the firm of Wiley, Rein & Fielding, who will serve out the balance of former Chairman Patrick's term, until June 30, 1992.

The elections resulted in only one significant change in the Congressional lineup with respect to Committees with jurisdiction over telecommunications issues. In the House of Representatives, Cong. John Dingell (D-MI) remains as Chairman of the Energy and Commerce Committee, with Cong. Edward Markey (D-MA) Chairing the Subcommittee on Telecommunications and Finance. Cong. Jack Brooks (D-TX), however, took over as Chairman of the Judiciary Committee from former Chairman Peter Rodino (D-NJ). Brooks, a long-time advocate of tough enforcement of the antitrust laws, will have a major role to play with legislation dealing with the Modification of Final Judgment (MFJ). No major changes took place in the Senate. Sen. Ernest Hollings (D-SC) remains as Chairman of the Commerce, Science and Transportation Committee, with Sen. Daniel Inouye (D-HI) Chairing the Subcommittee on Communications.

NATA has been extremely active in the Courts, the FCC, the Executive Branch, and on the Hill in the past year on issues of importance to the competitive industry. Much of the work has centered around the MFJ including preservation of the line-of-business restrictions: international trade, Sales Agency programs and, through the American Public Communications Council (APCC), a NATA Council, issues relating to the competitive payphone industry.

MFJ

There is arguably nothing in the public policy arena of more importance to the competitive industry than the Modification of Final Judgement, the Federal Court decree which split up the old Bell System. Through the establishment of a new AT&T and the seven Regional Bell Holding Companies, the Court intended to create a truly competitive marketplace for telecommunications. The result has been drmatically lower equipment prices, improved quality and choice, and the availability of an array of new services unheard of under the old monopoly.

Yet, almost from the day the decree was entered, the Regional Bell Companies (RBOCs) have worked to undo the core line-of-business restrictions placed on them by the MFJ. Those restrictions restrict the RBOCs from manufacturing equipment, owning information services, and providing long distance service. Their goal, in other words, is to bring down barriers that would allow the re-emergence of the old monopoly on a regional basis.

The past year has been no exception and has, in fact, seen newly energized efforts. In the Congress, those efforts first took the form of a sense-of-Congress Resolution introduced in 1988 in the House of Representatives. That measure, H. Con. Res. 339, would have changed no laws, but, if approved, would have put the House on record as favoring elmination of the restrictions on RBOC manufacturing and information services. Although that measure gained 205 co-sponsors, the 100th Congress adjourned without taking any action on it.

The newly-elected 101st Congress has seen the introduction of H.R. 2140, known as the Swift-Tauke bill. Congressmen Al Swift (D-WA) and Tom Tauke (R-IA) are members of the House Telecommunications Subcommittee and have introduced similar legislation over the past several years. H.R. 2140 would allow the RBOCs into equipment manufacturing and the ownership of information services. In the manufacturing arena, it would allow the BOCs to purchase their own equipment, a practice known as self-dealing. Since the RBOCs account for some 70% of the equipment market, its effect on other manufacturers and equipment vendors would be dramatic.

Both the House Commerce and Judiciary Committees have jurisdiction over this legislation. Significantly, and for the first time, both Dingell and Markey have announced their support for legislative action, arguing that the Congress must reclaim its jurisdiction over this vital issue from the Federal Court.

Markey's Telecommunications Subcommittee held several hearings on the matter, with the professed goal of reaching a consensus on the issues. Following completion of the hearings, the Subcommittee staff was charged with drafting a new bill, the introduction of which was expected after Congress reconvened in September 1989. At this writing, no new proposal has been put forth, although one is expected.

During this legislative process, Dingell wrote to the Attorney General asking for Justice Department help in crafting legislation. NATA also wrote the Attorney General, suggesting that the Justice Department had an obligation to enforce the nation's antitrust laws and to stand by the Decree which that Department originally crafted and approved.

Unlike the Commerce Committee leadership, the Chairman of the Judiciary Committee has announced no position to date. Cong. Jack

Brooks, who Chairs both the full Committee and the Antitrust Subcommittee, conducted two days of hearings in early August. NATA President Edwin Spievack testified in strong opposition to any legslative action, saying that the restrictions in the MFJ continued to work well, and that the government had an obligation to support the Consent Decree which it had helped craft and had approved. Brooks, while taking no public position, demonstrated his skepticism over such legislation through his comments and questions.

On the Senate side, neither Hollings nor Inouye have expressed much interest in pushing for legislation at this time. Indeed, Inouye, who Chairs the Communications Subcommittee, has publicly affirmed his support for the MFJ. The Senate Judiciary Subcommittee on Antitrust, Monopolies and Business Rights would share jurisdiction. Its Chairman, Sen. Howard Metzenbaum (D-OH), while not actively involved at this stage, has been supportive of the competitive industry in the past.

All these factors, coupled with the press of budget and appropriations business facing the Congress in the balance of this session, make it unlikely that the Hill will take any final action on this legislation during 1989.

BOC efforts to erode the MFJ have not been limited to Capitol Hill, however. The BOCs have been equally aggressive in the Courts and at the FCC in efforts to chip away at the MFJ's competitive protections.

In January, 1989, the Department of Justice (DOJ) asked Federal District Court Judge Harold Greene, who oversees the Consent Decree, to rule that the MFJ allows the Bell companies to provide

R&D financing for equipment manufacturers and to receive royalties on the sales of any equipment so developed. NATA took strong exception to the DOJ request and in its filing, told the Court that the Department's request was inconsistent with its earlier positions and that it would encourage anticompetitive activity by creating a purchasing bias on the part of the BOC in favor of the equipment it helped fund. By mid-September, no decision had been handed down by the Court.

In December 1987, having completed the first triennial review of the MFJ, the Federal Court ruled that the RBOCs should still be precluded from manufacturing and from ownership of information services. He did, however, allow the BOCs to provide transmission of information services owned by others. In April 1989, the RBOCs and DOJ filed briefs with the U.S. Appeals Court which challenge Judge Greene's rulings. The RBOCs claim that the information services prohibition violates their First Amendment rights. Both the RBOCs and DOJ contend that Greene improperly considered factors such as the U.S. trade position and ratepayer impact when he made his manufacturing decision. They also contend that the judge should have given more credence to FCC regulations to prevent competitive harm. The FCC then filed an *amicus curiae* brief in support of the RBOCs appeal, saying that the Court failed to give proper deference to FCC expertise and authority.

NATA, along with other related groups, strongly supported the Judge's decision. In its brief, NATA told the Appeals Court that if the ban were lifted the RBOCs could use their monopoly position to "provide affiliated manufacturers with unwarranted competitive advantages." NATA went on to say that the Court applied the correct antitrust standard, analyzed market conditions in great detail, and "carefully examined claims of regulatory improvement" and that, having done so, the Judge concluded the RBOCs and DOJ had failed to show that regulators could deal with the "continuing risks to competition." Oral argument is set for December 1989 in the case.

In another, related matter, the Justice Department in July 1989 announced a delay in the second trienniel review of the MFJ. Citing the fact that appeals of the Court's decisions from the first review are still pending, DOJ explained that a second review would be premature.

In response, the Court told Justice that when and whether there is ever another review is totally up to them. Saying that the reviews were DOJ's idea initially. the Court said that the reviews are not really needed, as the RBOCs and DOJ have kept the decree under constant review through an "incessant stream" of motions and requests for waivers.

FEDERAL COMMUNICATIONS COMMISSION

NATA has continued to battle at the FCC as well during the past year to preserve competition. During the past year, AT&T attempted to offer promotions that promised large users "free" customer premises equipment (CPE) when they subscribe to certain high volume services, such as its Software Defined Network, Megacom and Megacom 800 services. In a filing at the FCC, NATA argued that the effect of such offers by AT&T is to "cross-subsidize its own CPE offerings" and to shut out other vendors.

Responding to NATA's complaint, the FCC rejected the AT&T plan as "patently unlawful". Although AT&T had argued that including CPE as a "promotional device" is not the same thing as putting it under tariff, the FCC called that argument irrelevant. The FCC said the plan constituted "forbidden tariffing and bundling" of unregulated equipment with regulated services.

During this period, disputes arose with respect to joint marketing activities, including the use of customer proprietary network information (CPNI) and the use of telco personnel. Also, there remains great uncertainty as to the limits on joint marketing activities such as joint sales, advertising, customized and individual pricing, and Tariff 12.

Additionally, the impact of the Supreme Court's 1986 decision cutting back on the FCC's pre-emptive powers began to show up in other action. The Court of Appeals reversed the FCC's attempt to prevent state regulation of inside wire maintenance. The market effects of that decision are as yet uncertain and NATA is keeping a close eye on the situation.

SALES AGENCY.

1989 brought dramatic reinforcement and expansion of RBOC sales agency programs across the country. In August 1989, NATA claimed a major victory when the U.S. Court of Appeals for the District of Columbia affirmed the FCC's 1987 order requiring the Bell companies to establish sales agency programs. The FCC Order requires the BOCs to establish sales agency programs as a prerequisite for integrating the marketing of their CPE and network services. Through sales agency, authorized CPE vendors earn commissions on the sale of centrex and other network services. NATA, having pressed for and won the FCC agency requirement, led the appeal on behalf of those supporting the Order. NATA's arguments were endorsed by the Court of Appeals. The Court denied Ameritech's petition that sought to reverse the FCC's agency order on the grounds that the FCC had overstepped its authority in imposing such requirements for telcos' marketing of intrastate services. The Court reconfirmed the FCC's authority to regulate intrastate services because of the inseverability of the intrastate and interstate elements of centrex and like services. The Court also called the economic basis for imposing the sales agency requirement "indisputable." The Appeals Court recognized that any firm hoping to compete within the CPE market must combine its equipment offerings with a network services package, but that the addition of network services--such as centrex--"to a CPE firm's marketing portfolio is not without incremental cost." Absent commission payments, the court recognized that independent CPE vendors must incorporate the full incremental cost of marketing network services into their prices for CPE," placing them at a distinct disadvantage in their head-to-head rivalry with the BOCs and threatening long-term CPE competition. The value of agency as a competitive safeguard was further reinforced in an FCC ruling issued that same month. The ruling was issued in response to a request by data communications equipment manufacturers for the FCC to require all Bell companies to include data products in their agency programs. Currently, sales agents earn commissions on centrex sales in all seven Bell regions. Data communications offerings, though available to many agents are not yet available to agents in all Bell regions. While the Commission refused to make it mandatory for Bell companies to include data-communications network services among compensable services at this time, it restated its original intent for agency as a vehicle for establishing competitive parity for equipment vendors when telephone company marketers are able to integrate the marketing of regulated network services with CPE. The Commission merely deferred any necessary "corrective action" until after it completes its upcoming two-year review of sales agency scheduled to begin this December. The Commission noted the value of discussions now underway between independent vendors and Bell companies to expand the number of services included in sales-agency agreements.

NATA has worked assiduously to foster such discussions, creating forums at UNICOM, NATA's annual trade show--and in the field. NATA has helped the agents and the Bell companies address overarching concerns and ways to further refine their business relationship. NATA has participated in industry conferences and forums to reinforce the value of third-party distribution of network services. And, where they have formed, NATA has participated in RBOC-agent councils, offering the Association's assessment of what works best from region-to-region to the benefit of participating agents, their customers, and the Bell companies. The result has been a dramatic expansion in the number of agency positions available to independent vendors and in the range of products available for their distribution. During the year, BellSouth added T1 and 56kbps services, among other offerings. Pacific Bell expanded its initial two-LATA program to include all ten LATAs in California. At press time, Bell Atlantic was anticipating expanding agency from its three-LATA program to make it availabile throughout the entire Bell Atlantic region with a broad menu of compensable products, including T1 and other data communications services. And Southern New England Telephone became the first independent telephone company to establish an agency program voluntarily. Even in advance of such expansion, agents' performance during the year increased 400% over 1988. And NATA's research on these programs suggests agents' earnings for themselves and the telephone companies they represent will be even more dramatic in the coming year. Furthermore, agency for local exchange services is just the first of a broad array of strategic alliances NATA is pursuing for equipment vendors in the restructured market. With the explosion in demand for data communications, the advent of Open Network Architecture--among other regulatory shifts--and increased competition in long-distance markets, NATA envisions numerous profitable partnerships for equipment vendors entering strategic alliances to address users' mounting needs for computer and communications solutions.

INTERNATIONAL TRADE

Trade issues have emerged as significant factors for the manufacturing and distribution sectors of the industry. The Omnibus Trade Act of 1988 is in effect, and is being used to pressure other nations to make changes in their trade policies. So far this year, we have seen Section 301 used to open the Japanese cellular market and "Super 301" used to force a look at various structural barriers to American products in Japanese and other markets. Additionally, and of more immediate impact, AT&T and Comdial filed a petition with the International Trade Commission (ITC) alleging that certain CPE was being "dumped" in America by a number of Japanese, Korean and Taiwanese companies. The Omnibus Trade Act contains a provision requiring the United States Trade Representative (USTR) to conduct an annual compliance review of all existing telecommunications trade agreements with other nations. After conducting that review, the USTR, on May 8, found that Japan was in violation of the Market Oriented-Sector Selective (MOSS) agreements. Specifically, the USTR said that Japan had not lived up to the agreement with respect to access to Japanese markets in the cellular area. Under the Act, that decision required that the USTR institute a Section 301 proceeding. Under 301, the USTR publishes a list of products and/or services as targets of potential retaliatory duties. A tight time frame is set forth by the Act under which the duties must be imposed, unless the nation found in non-compliance corrects the situation.

In this instance, the USTR list of targeted products was sweeping in scope, covering not only most telecomunications products, but also cosmetics and mini-vans. NATA became actively involved in the case, as imposition of 100% retaliatory duties on equipment would have had serious consequences for the distribution industry. The USTR held a hearing on May 24, at which NATA was one of the lead-off witnesses. Citing the many difficulties such duties would cause the industry, NATA suggested that, should duties be necessary, they should be targeted at the specific problem area, *i.e.*, cellular. NATA maintained that the Japanese had made major strides in opening its markets in telecomunications and that it was inappropriate to make the entire industry pay for a problem in one sector.

In the meantime, NATA worked with its counterpart in Tokyo, the Communications Industry Association of Japan (CIAJ) to help bring about a change in Japanese government policies in the cellular area. Further, NATA organized an informal group of companies and other trade associations which met frequently to discuss and implement a coordinated approach which included active lobbying of the appropriate Federal agencies.

These and other efforts were successful. The Japanese government made significant changes in its policies with respect to market access, allowing the USTR to close the case without imposing any duties.

The Act also contains a section commonly known as "Super 301," under which the USTR is charged with discovering and attempting to correct structural trade barriers in other nations. These are essentially institutional barriers to trade in general and are not limited to specific sectors of the economy.

In May 1989, the USTR cited Japan in a Super 301 investigation for trade barriers in supercomputers and communication satellites, as well as for structural trade barriers such as bid rigging, industry boycotts of U.S. exports, market allocations, and closed distribution networks. At the same time, India and Brazil were also named.

Naming Japan in this action means that the U.S. will attempt to negotiate a settlement with Japan that will result in the elimination of the barriers within three years. Significant progress must be made in each of these three years for negotiations to continue. Otherwise, sanctions must be imposed.

Needless to say, such tactics were met with great hostility. Indeed, the Japanese government refused to negotiate under such threats. After numerous diplomatic discussions, both the U.S. and Japan have agreed to discuss these problems (as well as structural problems the Japanese see in the U.S.) in a forum separate and apart from Super 301. These talks, known as the "Structural Impediments Initiative" (SII) get underway this Fall.

Also this year, AT&T and Comdial Corp. filed a petition with the ITC and the Commerce Department on December 28, 1988, charging that companies in Japan, Korea, and Taiwan were guilty of "dumping" small telephone systems on the U.S. market, causing significant harm to U.S. manufacturers. Specifically, the products involved are all telephone systems having between 2 and 256 nonblocking ports or up to 100 internal lines.

In a dumping case, the ITC and Commerce Department each conduct both a preliminary and final investigation. Specific timetables apply to each investigation. On February 13, 1989, the ITC concluded its preliminary investigation with the determination that there was a reasonable indication that U.S. industry was being harmed by imports from these three nations being sold in U.S. markets at less than fair market value.

This decision shifted the action to the Commerce Department, which is charged with determining the dumping margins. On July 26, 1989, Commerce concluded its preliminary investigation. It announced dumping margins for each company involved. Those margins ranged from a low of 0% for the Taiwanese firm Sun Moon Star, to a high of 178.93% for Matsushita, a Japanese manufactuer.
Results of the Commerce Department's final investigation are expected by October 10, 1989. Once completed, the ITC must then proceed with its final investigation, the results of which are anticipated by November 24. A thorough analysis of this and other trade issues is available in a NATA Research Report entitled "Telecommunications Trade Issues: An Overview of the Regulatory Framework and Analysis of Current Events." Copies of that report are available by contacting NATA.

COMPETITIVE PAYPHONE ISSUES

The American Public Communications Council (APCC) is a NATA Council devoted to representing the interests of the competitive payphone industry. The APCC undertook numerous legal, regulatory and legislative initiatives during the past year, including legislative efforts to foster the competitive industry and protect the consumer, and regulatory work in the area of equal access, end user common line access charges and other areas. Throughout 1988 and into 1989, the FCC grew deeply concerned over an increasing number of consumer complaints from around the country over high charges by certain operator service providers (OSP) and the inability of consumers to reach the long distance carrier of choice from competitive payphones. As a result of the many complaints and political pressure, in March 1989, the FCC's Common Carrier Bureau acted. The Bureau ordered five OSPs which had been the target of the complaints to identify themselves to callers and to place information stickers on or near phones they served. It further ruled that the firms must disclose their rates when asked by the caller and that they must stop blocking calls to other carriers.

The FCC's actions, however, were not enough to satisfy OSP critics on Capitol Hill. Cong. Jim Cooper (D-TN), a member of the Telecommunications Subcommittee, had introduced legislation, H.R. 971, designed to curb what he considered to be the abuses in the OSP industry. Cooper pressed ahead with hearings on his bill.

The APCC generally supported the Cooper bill as being a constructive contribution. The measure would impose the same requirements on all OSPs. The APCC agreed with the bill's major premise that many of the problems could be addressed by ensuring that users are fully informed as to the identity of the carrier of the call and of that carrier's rates, so that an informed choice could be made to use a different carrier if the consumer chose. Thus, the APCC supported the requirement that consumers must be able to access the carrier of their choice from any public pay phone.

The APCC, however, voiced its strong attendant concern that a viable "equal access" regime for transient end users must include provisions for how competitive payphone providers would be compensated for use of their facilities. The APCC raised an additional area of concern regarding fraudulent calls, saying there must be assurances that the local exchange carriers (LECs) will offer, and the interexchange carriers (IXCs) will receive and utilize, the screening information that allows the IXCs to recognize and refuse to carry calls that may be billed to the payphone access line through fraudulent means.

The APCC was successful in having the Telecommunications Subcommittee make important changes to the legislation, including a specific section requiring the FCC to "consider the need to prescribe compensation (other than advance payments) for owners of competitive public pay telephones for calls routed to carriers other than the designated provider of operator services for such telephones."

In June 1989, the Subcommittee approved the Cooper bill with the APCC changes. The full Energy and Commerce Committee has not as yet taken up the measure, nor has the Senate taken any action. The APCC will be monitoring the legislative situation and will take any actions necessary to protect the legitimate interests of both the public and the payphone provider.

On another front, in April 1989, the APCC filed a petition for declaratory statement requesting the FCC to rule that end user common line access charges may not be assessed on competitively provided public payphones under the Commission's current access charge rules. These charges are levied on each competitive payphone monthly, but are not assessed by the LECs on LEC-provided payphones. Essentially, the APCC believes that all pubic payphones are created equal for purposes of end user charges.

The APCC argues that the access charge rules do not authorize the EUCL charges on competitively provided payphones. Ccompetitive payphone providers are not "end users" but "carriers" under the access charge regime and do not fit the criteria for carriers "deemed to be" end users. For these reasons comeptitive public payphones cannot lawfully be assessed the end user charge. The case is currently pending at the FCC.

In May, the APCC filed comments at the FCC in response to Bell Atlantic's petition for rulemaking to require "billed party preference" (BPP) from all pay telephones. The APCC strongly believes that BPP should not be mandatory for all pay telephones. Such a system might serve the BOCs economic interests, but it would not serve the public interest. The existing equal access system is less costly than BPP, less confusing to callers, and offers more competitive choices. The FCC has already taken significant steps to improve this system with respect to caller convenience and choice. Mandatory BPP would increase the cost of 0+ service, reduce caller convenience and choice, and seriously damage large segments of the competitive public communications market.

First, mandatory BPP would impose large new costs on ratepayers to finance the system, at the same time wasting the substantial investments already made in the existing system. Second, mandatory BPP would not provide the promised benefits of caller convenience. Rather, it would promote caller confusion and degrade the quality of 0+ service. Third, mandatory BPP would constitute a retreat from the FCC's long established procompetitive policies and would deprive the public of the emerging benefits of public communications competition.

Although the Federal Courts have not ordered the implementation of BPP at any public payphones, the BOCs have led the divestiture Court to expect eventual deployment of BPP by repeatedly advocating it. Now that competition has emerged, however, the BOCs are having second thoughts. Now they are willing to implement BPP at their payphones only if it is imposed on their competitors as a mandatory access condition.

In any event, the APCC believes that the Commission should not be asked to mandate BPP merely to save the BOCs from a problem of their own making. The relevant concern must be what is in the public interest. This issue, too, is currently pending at the FCC.

In a third area of importance, the APCC has submitted comments to the FCC on petitions filed by National Telephone Services (NTS) and International Telecharge (ITI) requesting an 18 month waiver of an FCC order on OSPs which contained requirements regarding provision of access by means of "10XXX" access codes, as opposed to "950-XXXX" and "1-800-XXXX" access codes. This waiver is necessary to allow adequate time to address the serious danger of fraud that would result from unrestricted 10XXX dialing from competitive payphones and other CPE used for public communications. The APCC supports these petitions and agrees that a period of time is necessary for equipment manufacturers to develop hardware or software modifications that will enable payphone equipment to deliver calls made with the prefix "10XXX-0" while blocking, or collecting "sent-paid" charges for, calls made using the prefix "10XXX-1."

The APCC believes, however, that modification of payphone equipment, by itself, will not eliminate the serious risk of fraud from the use of 10XXX access codes at competitive payphones. All forms of 10XXX access, including 10XXX-1 access, result in delivery of the originating line number (ANI) to the interexchange carrier (IXC). Network call screening procedures necessary to prevent billing of 10XXX-0 calls to originating competitive payphone lines are far from being universally applied. Without major improvements in carriers' call screening arrangements, unblocking 10XXX-0 calls would expose payphone providers to a serious fraud risk.

It is the APCC view that the FCC's Common Carrier Bureau should grant the requested 18-month waivers and make them applicable to any competitively provided payphone. In addition, the Bureau should order that an industry forum be convened to develop solutions to the technological limitations of the LEC and IXC networks that create the danger of 10XXX fraud. The Bureau should also make clear that it expects these limitations to be overcome within 18 months, so that all 10XXX-0 calls from competitive payphones are handled in accordance with the billing restrictions associated with the originating number. Finally, the APCC argues that the Bureau should require that IXCs must relieve competitive payphone providers of liability to pay for incorrectly processed calls.

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